

A
T R E A T I S E
O F
Perspective.

O R,
The Art of Representing all manner of Objects,
as they appear to the Eye in all Situations.

CONTAINING
The Elements of Designing and Painting.

Illustrated with above 50 Figures in Copper.

Written originally in *French*,
By *Bernard Lamy* Priest of the Oratory, and
Faithfully Translated into *English*, by an
Officer of His Majesties Ordnance.

L O N D O N
Printed, and Sold by most Booksellers, 1702.



*The Right Hon^{ble}
John Earl of BUTE, &c.*

TO THE
RIGHT HONOURABLE
Sir Henry Goodrick, Kt. & Bar.

Lieutenant-General of the Ordnance, and
one of His Majesty's most Honourable
Privy-Council.

And to the
HONOURABLE

John Charlton
Christopher Musgrave
James Lowther
John Pulteney and
William Boulter } Esq;

Commissioners of His Majesty's Ordnance.

May it please your Honours,

Since the Noblest parts of the Mathe-
maticks are not only useful but neces-
sary to such as are concerned in an
Artillery, any Branch of that Noble Science
may claim your Honours Patronage, as being
intrusted with the Management of such a
weighty Concern as the Ordnance of the
A Kingdom.

The Epistle Dedicatory.

Kingdom. Your assiduous Application, and prudent Conduct, are sufficient Evidences, that His Majesty has discovered in your Honours, those excellent Qualifications so proper for executing his Orders; and that he may expect an inviolable Fidelity, from such as neither Pleasure, nor Ambition, can Corrupt, or divert from the meanest things that concern his Service.

I am proud of the Opportunity I now have, to make a Just Acknowledgment of the Favours I have received, since I had the Honour to serve in the Artillery; and humbly beg your Honours Protection for this small Treatise, which the Author's Character and my own Curiosity first invited me to read, and which his Plainness and Succinctness encouraged me to translate into *English*. I hope your Honours will pardon my Presumption, which I was prompted to by the Zeal I have for your Service, and the Profound Respect with which I am

Yours Honours

Most Obliged and

most Devoted Servant

A. F.



T H E

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PREFACE.

THE Mathematicks are so useful in all other parts of Knowledge, the Affinity of their noble Parts so considerable, and the Enquiry which hath been made after them so curious, that they have both contributed wonderfully to the Advancement and Perfection of Arts, and have occasioned several surprising Discoveries.

“ The Science of the Mathematicks (to use the Author’s words) “ is as Profitable as
“ it is Spacious and Difficult: It comprehends the Principles of all Arts; and there
“ is scarce a Science that stands not in need
“ of its assistance. Those therefore who
“ understand the Mathematicks, are the best
“ qualified for all manner of Employments;
“ they are more capable either for practising
“ Arts, or for governing and directing those
“ who practise them. Being accustomed to
“ clear Idea’s and coherent Reasonings, they
“ have a greater Capacity for all the Sciences,
A 2 “ and

The P R E F A C E.

“ and are entitled to such Penetration and
“ Exactness, as renders them Ingenious in all
“ Professions.

“ In former Times the Mathematicks
“ dwelt, as ’twere, in a Sanctuary, where
“ every one was not allow’d to approach:
“ They were Mysteries known only to a
“ few. Their Obscurity proceeded not from
“ any Artifice of those who improv’d them,
“ to make them seem more admirable, the
“ Truths they contain are simple and clear;
“ but cannot be perceiv’d without Labour
“ and Attention, and a patient Study of their
“ long Connexion; for such a Truth, or such
“ a Supposition, can be only clear to him
“ who has already unfolded a hundred others,
“ of which this is the Consequence.

“ Few are capable of that painful Atten-
“ tion that must be given to the Mathema-
“ ticks, we have a general Aversion to Dili-
“ gence and Application, it was therefore
“ the Work of several Ages to render them
“ perfect: a long Series of time was re-
“ quired to invent and collect the Truths
“ they contain, before they could be dis-
“ posed in that natural order, which makes
“ it easier now to comprehend their greatest
“ Difficulties in six Months, than formerly in
“ six Years.

The

The PREFACE.

The Example of several Persons of Piety and Judgment, who applied themselves to render the Mathematicks more easie, foreseeing what Advantages might be drawn from them, encourag'd our Author to publish his *Elements of Geometry*; and he would have given us a compleat course, if the pursuit of such Studies as are proper for one of his Character had not diverted him. His Description of the Temple of *Jerusalem* was the occasion of his recollecting what he had many Years before studied of Perspective; and the Benefit he found by it in that great Design, was his chief Motive for publishing this following Treatise, which ought not to be despised for its shortness, since the Excellency of a Book, is to be short and plain. Attention is always painful, and what lasts too long cloyes us. 'Tis not the enlarging on a Mathematical Demonstration that renders it easier, but the doing it so, as that the Brevity does not sink the Perspicuity. Here is nothing laid down without Demonstration; and no Rules are proposed without proof; and it contains as much Theory as any Book of Perspective can pretend to: It was not huddled together of a sudden, but after its being copied several times, and passing through the hands of several of his Friends; he examin'd it carefully, explain'd some

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things

The PREFACE.

things more clearly, turn'd others more advantageously, adding in some places, and retrenching in others, till he gave it the Form that it now bears.

The Subject is one of the most noble parts of the Mathematicks, 'tis a Science that considers the sight, and explains by Principles of Physicks and Geometry, the Reasons of the different Appearances of the same Object; or to give it a plainer Definition, 'tis the Art of representing Objects in a Picture, so as they would appear if the Picture were transparent. From this Art of representing or imitating of things seen with the Eye, proceeded the Art of Designing, and from thence the Arts of Painting, Limning, Carving, &c. all which, Painting especially, have such dependance on Perspective, that it was the Opinion of *Pamphilus* the Master of *Appelles*, that without the knowledge of Arithmetick, Geometry and the Opticks, that Art could never have been brought to Perfection.

'Twas thought proper to gratifie the English World with a Translation of this Excellent Piece. The Author's Character is sufficiently known from his other Performances: And those who take the pains to read this, will find 'tis not unworthy of him. I know no Book upon this Subject, in any Language, that contains so full and so plain

The PREFACE.

a Systeme of Perspective, as this I now publish : And how much we in *England* are at a loss, for want of a Performance of this Nature, is sufficiently known to all Lovers of Painting. I have taken care to render the Translation as Just and Exact as possibly I could, choosing rather to keep close to my Author, than to pursue the Embellishments of Language, which things of this Nature cannot well admit of.

A

TABLE

OF THE

CHAPTERS

AND

Principal Articles.

CHAP. I. **T**HE Excellency of Painting,
Perspective is its Foundation.

page 1

CHAP. II. *An Explication of the usual
 Terms, and the Principles supposed in Per-
 spective.*

19

*An Explication of some Terms not belonging to
 Perspective, yet often used in speaking of this
 Science.*

24

Suppositions or Postulata.

28

CHAP. III. *Of the Properties of the Section
 of two or more Plans, which meet or cut one
 another.*

40

CHAP.



The CONTENTS.

- CHAP. IV.** *Of the Properties of the Sections of a Picture, and the Plan made by the Rays that come to the Eye from the visible Object.* 45
- CHAP. V.** *Of the Disposition of the Objects designed to be represented; and of the situation of the Picture, or Perspective Plan, with relation to those Objects, and to the point from whence it ought to be seen.* 65
- I.** *Of the Disposition of Objects on the Geometrical Plan.* 65
- II.** *The situation and size of the Picture.* 73
- III.** *Of the situation of the Eye, or of the point of sight.* 80
- IV.** *Establishing the Necessity of Perspective, and answering the Difficulties which are fram'd against this necessity.* 86
- CHAP. VI.** *How to find the Perspective of any Object whatever, its situation being given in regard to the Picture and the Eye.* 95
- CHAP. VII.** *Of Pictures which are not perpendicular on the Geometrical Plan; which are inclin'd or parallel; which are sloping in respect of the Eye; and lastly, of those which rest on an unequal and irregular ground.* 126
- I.** *Of Pictures that are inclining or leaning* 129
- II.** *Of Pictures parallel to the Horizon.* 131
- III.** *Of Pictures that stand sideways in respect of the Eye.* 134
- IV.** *Of*

The CONTENTS.

- IV. Of Pictures upon Concave and Convex bodies, or in such as have Cavities and Eminencies. 135
- V. Of Pictures and Statues made to be placed in high and eminent places. 140
- CHAP. VIII. Shewing that the most important Rules for laying on of Colours, proceed from Perspective. 150
- CHAP. IX. A general Observation on the proportion of Shadows. 160
- CHAP. X. A Conference of Socrates with Parrhasius the Famous Painter, and with Cliton the ingenious Carver. 169



A N

INDEX.

A.

Accidental Point, what 22. 51. 96. how to be found 51.

Action, the moment of an *Action* can only be represented 7. 74.

Aerial Perspective, what 35. 152. 153.

Alcamenes the Carver 141.

Alley of Trees to put in *Perspective* 123.

Anatomy, Painters ought to know the *Anatomy* of a *Humane Body* 15.

Angle, things seen under equal *Angles*, are not always equal 36. 37.

Antonine Column, a fine Monument at Rome 175 foot high 142.

Appearance, things Concave or Convex, appear

flat, if seen at a distance 33. what is high appears low, and what is low appears high at a distance 33. things at a distance seem smaller 34.

B.

Base of the Picture, what 23.

Beauty of Painting consists in *Imitation* 91. 92.

C.

Carving, its difference from *Painting* 7.

Ceiling appears lower at the farther end of a long Gallery 33.

Center of the Picture, what 21.

Cilindrick body, how represented 133.

Circle, how to put it in *Perspective* 112.

Cliton the Carver 169.
Colouring

An INDEX.

Colouring a considerable part of Painting 18.

Colours, their natural cause

4. Rules for right applying them 150. Colours of Figures change according to the different points of sight 151. 154.

Columns, how put in Perspective 119.

Concave, things Concave appear flat, if seen at a distance 33. Pictures on Concave bodies ought to be seen at a distance 135. 148.

Concourse, Point of Concourse 48.

Concurrence, Point of Concurrence, what 21.

Convex, things Convex appear flat at a distance 33. Pictures on Convex bodies, ought to be seen at a distance 135. 148.

D.

Degradation of the Picture what 34, how found 70.

Difficulties against the necessity of Perspective answered 86.

Disposition of Objects on the Geometrical Plan 65

Distance, Points of distance

what 24. 98. Distance of the Point of sight 84. distance of the Eye, how found 84. 85.

Division of a Line, how found in Perspective 100

E.

Elevation, what 25

Explication of Terms belonging to Perspective 19. 24.

Eye, how it sees, 2 and 3. in a Point 28. Its situation 80. What is exactly opposite to it, is most sensible 81. to regulate its distance 85.

F.

Figure, to put any Figure in Perspective 111.

Fleeing Lines, what 21.

Fleeing Scales, what 48. how made 115.

Fortifications represented Geometrically 27.

Frame for finding the largeness of a Statue in a high place 144.

G.

Gallery adorn'd with Pillars, how put in Perspective 121.

Geometrical Plan, what 19. what is called Geometrical



An INDEX.

- Distance of sight 8.
 Eye, how to be drawn 10.
 Height of the Eye, what 20.
 Height of the Point of sight is the natural height of the Eye 81.
 Hollow body, how put in Perspective 124.
 Horizontal Line, what 19. 21.
 Ichnography, what 25.
 Imitating, Painting is the Art of Imitating 11.
 Imitation pleases in Painting 91.
 Incidence, point of Incidence, what 23.
 Inclining or Leaning Pictures 129.
 Leaning or Inclining Pictures 129.
 Light, wherein it consists 3. 4. 32. Light of the Sun different from that of a Lamp 165.
 Line, Ground line, what 23.
 Fleeing-line, what 21.
 Radial Lines, what 21.
 Line of Station, what 20. 21.
 Lineal Perspective, what 35. 153. 154.
 Lines, to find their Perspective, 104. 105. 106. 114.
 Luminous body 160. 161.
 M.
 Magnitude of shadows 161.
 Mathematicks necessary to a Painter 6. Mathematicks alone not sufficient to make a good Perspective 87.
 Military Perspective, what 27.
 Minerva's Statue at Athens 141.
 Model of a Picture, how to make it 129.
 Moment, a Painter can only represent the moment of an Action 8. 74.
 N.
 Nature the Object of Painting and Sculpture 142.
 Nature corrected by Painters 87.
 Necessity of Perspective established 86.
 Noble Perspective, what 27.
 O. Ob-

An INDEX.

O.
Objects at at a distance ap-
pear smaller 34. Dispo-
sition of Objects to be
painted 65.

Octaedre, how to put it in
Perspective 68.

Opaque body 160. 161.

Oribography, what 27.

P.

Parrhasius the Painter 169.

Painters can only represent
the moment of an Acti-
on 7. 74. they have less
liberty than Poets 17.
73. 74. they correct Na-
ture 87.

Painting, its design 6. its
difference from Carving
7. its Perfection, what
11. 13. what it is essen-
tially 10. 11. it differs
from Sculpture 75.

Parallelogram, to find its
Perspective 108.

Pavement appears higher
at the further end of a
long Gallery 33.

Perspective, what is taught
thereby 5. what it is 18.

the necessity of it esta-
blished 86. 'tis the Foun-
dation of Painting 18.

Perspective of a Point,

what 31. of a right line
31. of the surface of an
Object 32.

Perspective Aerial, what
35. 152. 153. Lineal,
what ibid. at a Birds
sight 82.

Perspective Scales, what
115. how made ibid.

Picture, every Picture is a
Perspective 6.

Picture, what 19. how situ-
ated on the Geometrical
Plan 20. 73. its size 73.
considered as a Window
78. 79. 80. it may still
be reduced to a vertical
situation 127.

Pictures inclining or lean-
ing 129. of Pictures pa-
rallel to the Horizon
131. of Pictures to be
placed on eminent places
140. Pictures on Con-
cave or Convex bodies,
ought to be seen at a di-
stance 135. 148.

Pilasters, how put in Per-
spective 116.

Pillars, how put in Per-
spective 116.

Point, Point of sight, what
20. its just distance 80.
84. Point of Concur-
rence,



An INDEX.

rence, what 21. Point of Incidence 23. Points of distance 24. 98. to find the Perspective of a Point 97. 101. 113.

Polygon, how to represent 133.

Principal Point, what 21. Not always in the middle of the Picture 80. sometimes without the Picture 81. most commonly in the Center of the Picture 81. sometimes above, and sometimes below 81. 82.

Principal Ray, what 20.

Profile, what 25. 26.

Projection, what 25.

Proportion of Shadows, how found 160. 161.

R.

Radial Lines, what 21.

Ray, Principal Ray, what 20. every Ray is a straight Line 28. Rays, what 29. Rays by which we perceive a Line make a Plan 30.

Retina of the Eye, what 2. 3.

Row or Alley of Trees, to put in Perspective 123.

S.

Scales Geometrical, what

48. Fleeing Scales, what

ibid. Perspective Scales, what, and how made 115

Scenography, what 26.

Sculpture differs from Painting 75.

Seat of Objects, what 23

Point of Seat, what 23. 68.

Semiteint, what 151.

Shadows, general Observations on their Proportion 160. 161.

Sight, how it is 2. 3. Point of sight, what 20.

Situation of Objects, how determin'd 21. Situation and Size of the Picture 73. Situation of the Eye, or Point of sight 80. Situation of a Picture may be reduced to Vertical 127.

Socrates his Conference with Parrhasius and Clinton. 169.

Spiritual part of Painting, what 66.

Spirit may be represented 171. 172.

Station, line of Station, what 20. 21.

Statues

An INDEX.

Statues to put in Perspective 123.

T.

Tacquet's Proposition false 36. 37. and 142.

Teint, what is meant by it 151.

Terms of Perspective explained 19.

Trajan's Column at Rome 143 foot high 142.

W.

Windows may be consider'd as Luminous bodies 162.

Workmen profit by the Conversation of the Learned 170. 174.

Explanation of the Notes used in this Treatise.

$\left. \begin{array}{c} + \\ - \end{array} \right\} \text{This} \left\{ \begin{array}{c} \text{signifies} \\ \text{More} \\ \text{Less} \end{array} \right\} \text{This} \left\{ \begin{array}{c} = \\ : : \end{array} \right\} \text{signifies} \left\{ \begin{array}{c} \text{Equality} \\ \text{Proportion} \end{array} \right\}$

ERRATA.

PAge 10. Line 17. for *seen*: 'is read *seen*, 'is. p. 14. l. 3. for ; these can represent read *can represent*. p. 86. l. 2. for *and* read *and*. p. 112. l. 12. for *Plan* read *Plain*. p. 124. l. 12. for *high* read *height*. p. 141. l. 21. for *Alcomenes* read *Alcemenes*. p. 145. l. 22. and p. 146. l. 5. for *Vault* read *Arch*. p. 146. l. 1 & 2. for *Helie* read *Elijah*. p. 147. l. 13, 19, 23 & 26. for *Vault* read *Arch*. p. 148. l. 12. for *Helie* read *Elijah*. l. 13. for *her* read *him*.

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TREATISE

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CHAP. I.

*The Excellency of Painting; Per-
spective is its Foundation.*

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2. for
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Alca-
Arch.
& 26.
l. 13.

A

TO represent upon Cloath, what is not
there, as Cavities and Eminences,
where all is Flat; and Distances
when every thing is Near; is a Performance
that merits Admiration. 'Tis an Effect, and
at the same time, a Proof of what the Eye
(to speak Philosophically) doth not see, but
only the Soul which forms to it self different
Images of Objects, according to the different

B Impressions

2 *ATreatise of Perspective.*

Impressions of the reflected Light on the Eyes. Nothing is more difficult to be expressed, than the Nature of these Images; whither it be that the Soul forms them out of its own Substance, and so sees it self, as it were, transform'd into all things; or if it sees these Images in a Substance above it, which being the Principle of all Beings, can represent all.

By this Advance, I mean only to discover a Difficulty, on which it would be requisite to make serious Reflections; for it concerns not the Subject I intend to treat of, and therefore it's sufficient at present to consider, that the Operations of Nature being Simple and Constant, the like Impressions in the Organs of Sense, ought to be followed with the same Sentiments; so that as often as the Eyes are struck after the same manner, the Soul must have in its view the same Images, whatever be their Nature and Origine. If (I say) the Rayes, by which we see a Picture, pierce the Eye in the same order as if they came from the Objects themselves, tho' we see but the Painting; and if the small luminous Bodies which compose these Rayes, shake and move after the same manner the *Retina*, that is, the small strings of the Optick Nerve, which line the bottom of the Eye, then the Picture must have the same Effect as the Objects



A Treatise of Perspective. 3

jects themselves: For the Optick Nerve furnishes the bottom of the Eye with a vast number of small Filaments into which it divides it self, and makes what we call the *Retina*: 'Tis there that the Rayes do in some measure paint the Features of the Objects from which they are reflected; as when a Chamber is shut so close, that there is no passage left for the Light, but through a Perspective-glass, the Rayes paint the Objects that are without, on a piece of white Paper, if it be opposed to the Glass. This Chamber represents the Eye, and the Paper the *Retina*.

The new Philosophy supposes the World full of small Bodies, and that it is their Action or Pressure, that makes us sensible of the Light. These small Bodies, in removing themselves from that which causes their Reflection, press those that oppose their Motion, and these in like manner press those that follow, by a Communication of Motion made in a direct Line from the Object to the Eye: 'Tis this Motion (according to our Philosophers) that informs the Soul of the Figure of the Object, as the Staff does a Blind-man of the Nature of things, by the Impression it makes in his Hand, as it is thrust forward or pulled back. So the Impression of the Luminous Bodies on the *Retina*, occasions

4 *A Treatise of Perspective.*

the Soul's having the Idea of the Object, that caused the Impression. For, we must know, that the Picture made by the Rayes, is only the Motion they impart to the small Strings of the Optick Nerve: Now, since the Pressure of the Matter which rests on the Optick Nerve, is the Natural Cause of the Sense of Light and Colours, because Red appears still Red, both with a stronger and weaker Light; we may conclude the different Celerity of Shakings or Vibrations of the Matter which presses the Eye, to be the only cause of the Variety of Colours; different Colours are in the same case as different Sounds, for the Sounds change not because of the variety of the force whereby the Air is agitated in the Motion, (for instance) of the Strings of a Lute, but because of the diversity of Readiness and Celerity in the Vibrations, the Parallel holds in all Points, bating that the Action of the Air conveys the Sound, and that of a Matter yet more Subtile, the Colours.

Thus 'tis the difference of the Shakings or Vibrations of the Matter which presseth the Eye, that adds the Colour of the Objects, to the Features of the Image, which the Rayes paint in the bottom of the Eye; that is to say, that 'tis the difference of the Motions, that this matter takes on the Surface of the Objects,

A Treatise of Perspective. 5

Objects, from which it reflects it self, that causes different Sensations; or 'tis the occasion of these Sentiments that we call Colours; Just as the Soul is sensible of different Tasts, according to the Variety of the Food that affects the Fibres of the Tongue.

However it be in this New Philosophy, it is agreed upon, that a Picture, when seen from a certain Point, reflecting the Light in the same manner as the Object it self would do; ought to have the same Effect as the Object whose Features and Colours it represents. That is to say, When it sends back the Luminous Rays in the same Order and Disposition, and with those very Motions that give the true Sentiments of each Colour, the same will the Effect be. This is what's taught by that part of the Mathematicks call'd *Perspective*, which I design to treat of.

A *Picture* may be consider'd as an open Window or transparent Glass, through which the Eye which is supposed to be at a certain Point, may see the Objects represented by the Picture. Now by the help of the *Mathematicks*, the passage of the Rayes which render the Object Visible, may be trac'd in the Picture or transparent Glass. This passage being marked with suitable Colours, the Picture represents the Features of these Objects, their Form, their Colour, and in a

6 *A Treatise of Perspective.*

word, all their Appearances. And since it makes the same Impression, the Soul must have the same Images in its view, and be thought to see the same things.

Mathematicians draw only Lines, they cannot finish a Picture; And on the other hand, Painters cannot begin it, without a regard to the Rules taught by the Mathematicians. Every *Picture* is a *Perspective*, so that what is taught in this part of the *Mathematicks*, is the Foundation of *Painting*, which ought to be well adjusted, for all Painters do not agree to it.

The Design of *Painting*, is to represent on a flat Body, as Paper, Cloath, or a Wall, whatever is desired. This can never be done, if the view of the *Picture* makes not the same Impression on the Eyes, as if they saw the things themselves. And this is what *Perspective* does exactly. Painters that are ignorant of this, can never succeed but by chance; for in *Painting* by the Eye in Imitation of Nature, as they do, 'tis impossible to form their Features so just, or range them so exactly in their true places, as the Rays of things supposed beyond the *Picture*, would do other Features in piercing the *Picture* if it were transparent.

For a clearer Conception of these things, Let us consider, that there is a great difference

A Treatise of Perspective. 7

rence between *Carving* and *Painting*. A Statue that stands by it self may be seen on all sides, it shews all its parts. As for Example, the Statue of *Hercules* in the Palace of *Farnese*, represents the Body of *Hercules* intire; it may be seen all round, and viewed from different parts; it is not the same with a Painted Picture, which is terminated by a single Stroke, representing only and precisely the Circumference in which the thing that is Painted appeared to the Painter that design'd it, and in which he designs it shall appear. So that this Circumference is different according to the different points of sight; and cannot be proper for representing the same Object seen from another side. This is the reason why all the Draughts of the *Hercules* of the Palace of *Farnese* are not alike, because this Statue was designed by different Persons, who did not all behold it from the same side.

Let us here consider, that Stones and other Inanimate Matters, can keep the same Situation a long time, whereas all that hath Life, is continually changing, and in a perpetual Motion. The most ingenious Painter cannot represent these Changes; all he can do, is to paint the Moment of an Action; that is to say, the Situation of every thing, the Motions, the Postures proper to every Actor, and the

8 *A Treatise of Perspective.*

Character of the Passion with which he was animated in the Moment of the represented Action. Nor can he thus Paint several Actions in one Picture.

In Drawing the Picture of a Person supposed to be alone, it suffices to observe in his Visage, and in his Countenance, the Character of his Genius, and of his ordinary Inclinations, his Physiognomy, or the Strokes of his Face, which are peculiar to himself; but in representing an Action of Consequence, to which many contribute as Actors, or Witnesses, every one, according to the part he undertakes, should make appear by his Eyes, and by his Posture, what he is thinking that Moment. This is the Moment a Painter can represent; this is the Point where all his Work tends; his nicest Point, I say, is, that having placed at a certain Station, him that is to consider his Picture, he sees the same thing as if the Cloath becoming in that Moment Transparent, he saw the Action it self, which is the subject of the Picture.

This being well considered, it is easie to establish the Necessity of Mathematical *Perspective*. It is impossible to see precisely the same things, from two different Stations or Points of Sight: The Eye being placed in a certain Point, from whence it sees at once a whole

A Treatise of Perspective. 9

whole Action, perceives nothing but what is opposite to it. If it see the Front of a Person, his Back is hid; it cannot at the same time see above and below the same thing. The Line which terminates what the Eye discovers, is so peculiar to what it sees in the Situation it is in, that there would be a necessity of drawing a new the out-lines of a Figure, if the Eye were moved to another place; for it is evident, that the Figures of things alter, as they are seen sloping, sidewise, or in Front; they become likewise smaller or bigger, as they are more or less distant from the base of the Picture; so that a Picture can be only made for one single Point or Station.

'Tis impossible to find exactly by chance, all the out-lines of a Figure, and the bigness suitable to it in the place where it is designed to be: This cannot be done true by Just and Infallible Rules, without the Mathematicks: But after all, one cannot err in these things without mistaking grossly; for, once more, can a Figure be seen behind and before at the same time? What is seen at a distance, hath it the same Appearance as if it were near? Is it reasonable to give a Figure almost the whole height of a Column, which, in the Object represented, is 30 or 40 Feet, when at the same time the Natural Height of this
Figure

10 *A Treatise of Perspective.*

Figure is not above 5 or 6? These are nevertheless Faults very ordinary to Painters, particularly to those who Copy the Works of some great Masters, not taking notice that the Painter, whose Works they steal, hath given a Circumference to his Picture, which will not be convenient for it, in the place whither he carries it.

Many imagine *Perspective* to be useful only in representing Walks, Trees, or Architecture, because they distinguish it only by a Concourse of Lines to one single Point. But since a Picture cannot have its Effect, if the Rayes, which it reflects, come not to the Eye, in the same order as if the Cloath let the Light pass through, or that by the opening of the Picture, the things themselves were seen: 'Tis the passage of the Rayes that is searched for in the *Painting*, as well as in the *Perspective*, that ought not to be so distinguished. To enable us to judge the better, let us see what *Painting* is essentially.

We may say of *Painting* as of *Eloquence*: There are general Rules for Writing and Speaking Judiciously and Nobly; but as being Master of these Rules, is not sufficient for Speaking and Writing on all sorts of Subjects, on *Philosophy*, on the *Mathematicks*, or on *Theology*; and what Eloquence soever one may have, he can never speak reasonably on

A Treatise of Perspective. 11

a Subject he knows little of. So a *Painter* cannot represent but what he knows, tho' he search to the bottom of his Art. For Example, He cannot represent a Battel well, if he is ignorant of the Method of Drawing up an Army; nor a Sea-fight, if he be no Seaman. But this does not imply, that a good Painter ought to be both Soldier and Sailor. 'Tis true, there are some Subjects that Painters so commonly treat of, that it seems essential to their Art, not to be ignorant of them. Could a Painter be Excellent, if he knew not a Man? I mean the outside of a Humane Body, and what may appear on that outside; the Veins, the Muscles, and the Tendons; he ought therefore to be perfectly well acquainted with the Anatomy of the outside of a Humane Body. Those who apply themselves to the Painting of Beasts, ought to make the same Inquiry. To paint a Horse well, 'tis convenient to know the Anatomy, and most esteemed Proportion of his parts.

In fine, Painting is not essentially limited to represent any particular Subject. It is in general the Art of Imitating; and its Perfection is, that the Imitation is so Natural, that the Picture makes the same Impression, as the Object it self that the Painter would imitate. There lies the Beauty of his Art: 'tis the Address with which he imitates what he

12 *A Treatise of Perspective.*

he would represent, that makes him esteemed ; for we are sometimes charm'd to see that in a Picture, which would be frightful if we saw it really. A Serpent causes Fear, but its Picture, if well done, is charming: So that 'tis the Skill of the painter that pleases.

Now the Imitation is not perfect, if it have not the same Effect as the thing it self ; that so the Eyes may be agreeably deceived. Therefore since a Picture can have only one point of sight, and since each Figure expos'd to view, hath a certain Circumference peculiar to it self, in relation to the point from whence 'tis supposed to be seen ; and a certain bigness, which depends on the distance in which it is represented, we must of necessity have recourse to the Mathematicks, without which it cannot be done to the utmost Preciseness. It may be said, there are Pictures that please without that Nicety. I own it ; but whom do they please ? None but such as do not compare them with the things the Painter would have them represent. 'Tis the Resemblance of Truth that pleases in painting, as hath been said. How can this Resemblance exist in a Picture, when every thing confutes it, when the Ground he represents is too large or too small for the Actions that are supposed to be done there ? When what ought to be separate, are huddled

A Treatise of Perspective. 13

dled together; and what should be joyned, are remote? When all is too great, or too little, and nothing hath its just Measure? Painters, after having made their Figures, do generally adorn the bottom of their Picture with a piece of Architecture, rich and fine in appearance, for if we examine the Plan in order to find, for Example, the foot of a Column, we shall find it rests on the head of some Figure. Can such Pictures please indifferently? We shall now examine its Perfection, and the Enquiry is neither Vain nor Ufeless; for the Rules of *Perspective* are as easie as they are sure.

Let us then conclude *Perspective* and *Painting* to be the same thing; save only that *Perspective* is made to consist, in finding Geometrically, (as I do in this Treatise) the Points, at least the *Principal*, through which the Rayes pass, that would shew the Object that is painted, if the Picture were Transparent. I say, the *Principal* Points, for it would be too tedious to search for all with Rule and Compass. The Eye alone hath an infinite Number of Features proper to it self; and besides that, two Men have not their Eyes intirely alike, the same Eye can change as many ways, as the Soul can have different Motions. Only they who have study'd Nature, and by a search after, all its

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14 *A Treatise of Perspective.*

Characters, have acquired that Facility of imitating what they see, or what they conceive; ~~these~~ can represent things as they are. All a Geometrician can do, is to determine the Greatness and Situation of Figures in a Picture. That's what belongs to *Perspective*, the rest is the Work of the Painter, or of one who is wont to imitate or design what is seen; especially to mark well the Outlines. 'Tis in this they exercise themselves in Academies, who design after a Copy, or in particular, after a *Relief-work*.

A Skilful Painter having once, by the help of *Perspective*, found the Position of some Points in the Circumference, which he endeavours to compass, finishes it easily; which is impossible to those that cannot design. There are a thousand fine Strokes, of which one may find several Points, and yet not be able to finish them. Every Motion hath a proper Posture; every Passion hath a Character in the Visage; every Age, every Sex, and every Condition, a certain Air, which he must be a Judge of, and know how to express; otherwise, what is done, represents nothing that hath Life, all is dead; for the Air and Features of a Body full of Life, are very different from these of a dead Body. However it may resemble something that had once Life, there are still the same
Features

A Treatise of Perspective. 15

Features but much changed. Nothing but a long Exercise, and an extraordinary Genius, a Curiosity and a Nicety more than ordinary, can make one sensible of the difference.

Let us add, that tho' the Art of Painting consists in Imitating, yet a Painter that can only Imitate what he sees, is no Artist. What he represents should be Beautiful and Fine, and there is no Beauty but what is Imperfect. He must therefore imagine what is not, and form a Resemblance finer than the finest things can be found; for when he forms to himself an Idea, it may happen that nothing can be found intirely resembling it. He ought therefore to dive into what things may happen, in all the Conditions in which they can be apprehended. To represent the Posture of a Body that one sees before him, 'tis not requisite to be an Anatomist; but without the Knowledge of Anatomy, 'tis impossible to represent correctly a Posture, which he conceives but does not see.

The *Science* of a *Painter* ought to be infinite, if he undertakes to meddle with all Subjects; but he undertakes a large Task, when he confines himself to Man; that alone is sufficient to imploy him. He cannot Paint all the Interior Motions that are hid from him; but since these Motions have their Signs

16 *A Treatise of Perspective.*

Signs on the Visage, he may still represent them. Those who have writ of Painting, have done this at large: They have examined the Proportions of a Humane Body, as to Age and Sex, and as to the Condition to which Nature renders them most proper. For it is evident that there is a certain Disposition of Body necessary to make a Wrestler, which is not always found amongst those that are proper for Government; so that we must judge of a good Proportion, with relation to the Quality of the Subject.

This Search after suitable Proportions, was the Study of the great Masters of Antiquity: A single Statue, or the Painting one Figure in a Picture, imployed a part of their Lives: They were not satisfied to imitate only what they saw; if they painted a *Wrestler*, they formed the most noble and perfect Idea that was possible, of a robust well-made Body. To this end they considered all the *Wrestlers*, measured them exactly, and taking from each what appeared to be perfectest, in relation to their Design, they formed that perfect Idea of an Agile, Robust, and Well-proportioned Body. If they made a Statue, or picture, of *Venus*, that is to say, of a fine Woman, they made the like Search on all Bodies, where they perceived the Features of a rare Beauty:

Since

A Treatise of Perspective. 17

Since I speak of *Painting* more as a Mathematician than as a Painter, 'tis not my business to advertise *Painters of History*, that they ought (as Poets in a Comedy) to be careful of the Unity of Action, Time and Place, and for that reason to paint but one Action in one Picture, with what relates to it, and is necessary to denote it. A multitude of Persons causes Confusion, this may be avoided by making none appear but who are necessary towards the execution of that Action, in their convenient Postures: All ought to be attentive Witnesses, and shew in their Countenances the Motions with which they may and ought to be animated, in relation to their State, Sex, Age, Quality, and to their part in the Action, which is the subject of the Picture. Above all things, Likelihood and Decency must be observed; Painters have much less liberty than Poets, for a Poet may allow 24 hours to the Action he represents, but a Painter can only represent the Instant of an Action, and what is seen at one single look. This would need a more ample Explanation, if I designed a compleat Treatise of *Painting*; I speak but as a Mathematician, and therefore cannot treat of Colours, of the matter of which they are composed, nor of the manner of mixing them, so as to imitate the natural Colour of the Objects to be painted. There

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are

18 *A Treatise of Perspective.*

are Secrets for preserving Paintings always clear and lively. Colouring is a considerable part of *Painting*. The Mathematicks make Abstraction of the sensible Qualities. *Perspective* then, which is but a part, can be no other than an Application of *Geometry*, to find the passage of the Luminous Rayes, that will make the things themselves appear, which are supposed to be behind the Picture, and are to be there represented. *Perspective*, I say, is the Foundation of *Painting*, but it is not sufficient to make an accomplish'd Painter, I am far from pretending it: The Idea which I have given of *Painting*, shews that I have other thoughts; but after all, what I have said, will serve to prove, that *Perspective* is useful to a Painter, that 'tis that which regulates his Designs; that without it he works but at random, and cannot keep up to the nicety of just Measures. In the first place, we will see which are the Terms used in *Perspective*, and which are its Principles.

CHAP.

CHAP. II.

*An Explication of the usual
Terms, and the Principles
supposed in Perspective.*

Definitions or Explications of the Terms
peculiar to Perspective.

DEFINITION I.

A Geometrical Plan, is that on which the Spectator, and the Objects he considers, are supposed to be, and on which the Picture is raised, in which the Objects are to be represented.

THE Square X is the *Picture* or *Perspective Plan*, and Z is the *Geometrical*. What we here term a *Geometrical Plan*, is sometimes called the *Pavement* or *Ground*. (See Plate 1. Figure 1.)

The *Geometrical Plan* is generally supposed to be parallel to the *Horizon*, therefore the Line in the *Picture*, that's parallel to the *Geometrical Plan*, as G H, is called the *Horizontal Line*.

The *Picture*, or *Perspective Plan*, may be either Perpendicular, or inclining on the *Geometrical*

20 *A Treatise of Perspective.*

metrical Plan; or it may be parallel to it, when compared with the Spectator, it is said to be direct or sloping, as it is seen in front or sidewise. In fine, it may be placed above or below the Eye; in all these Situations 'tis still between the Eye and the visible Object. Its ordinary Situation, is to be perpendicular on the *Geometrical Plan*, and direct in respect of the Eye; and in this Situation we suppose it to be, when no other is mentioned.

DEF. II.

The height of the Eye, above the Geometrical Plan, is the Perpendicular which measures that height.

This Line is likewise called the *Line of Station*; so B representing the Eye, the Line B D is the Line of Station. Some Authors give this name to the Line D K, of which elsewhere.

DEF. III.

The Principal Ray is a straight Line drawn from the Eye, perpendicular to the Plan of the Picture when it is upright, as is here supposed, and the Point where it falls, is called the Principal Point, or Point of Sight.

A B is the *Principal Ray*, and A the *Point of Sight*. It is the *Principal Ray* that measures the

A Treatise of Perspective. 21

the distance of the Eye from the *picture*. The *Principal Point* is called sometimes the *Center of the Picture*, and *Point of Concurrence*, because several Lines meet there, as we shall see, and cut one another if they were prolonged, as the Semidiameters of a Circle in the Center, wherefore these Lines are in such a case called *Radial*. Some Lines there be, that seem to flee and lose themselves, and are therefore called *Fleeing Lines*.

D E F. IV.

The Horizontal Line, is that which passes through the Principal Point A, and is parallel to the Ground Line G H.

Imagine a *Horizontal Plan* passing by the Eye, and cutting the *Picture*, the Section of this *Plan*, with that of the *Picture*, is what we call the *Horizontal Line*.

Let A C be the Section of the *Picture*, and of a *Plan Vertical*, or perpendicular on the *Geometrical Plan*, and passing by the Eye of the *Spectator*, and D K the Section of the *Vertical* and *Geometrical Plan* Z, it is the Proportion that Objects have with those two Lines, that determines their Situation on the *Geometrical Plan*. Some call the Line D K the *Line of Station*, as we have said before.

22 *A Treatise of Perspective.*

The Line BD the height of the Eye, which we have called the *Line of Station*, and the Line BI, which is the *Principal Ray*, prolong'd, are both in the *Vertical Plan*.

DEF. V.

The Accidental Point is a Point in the Horizontal Line, where Lines parallel amongst themselves tho' not perpendicular to the Picture, do meet.

We shall demonstrate, that the *Perspective* of Lines which are perpendicular to the *Picture*, meet in the *Principal Point*; and that the *Perspective* of those that are parallel amongst themselves, but not perpendicular to the *Picture*, meet in another Point likewise in the *Horizontal Line*. This Point is called *Accidental*, to distinguish it from the *Principal Point*, which hath a determined place; the other hath no fixed place, because of the different Situation of the Lines, whose *Perspectives* meet in this Point. It is called *Accidental*, because the ordinary Situation of a *Picture*, is when the parallel Lines cut it, at Right Angles; so that their *Perspectives* concur in the *Principal Point*.

DEF.

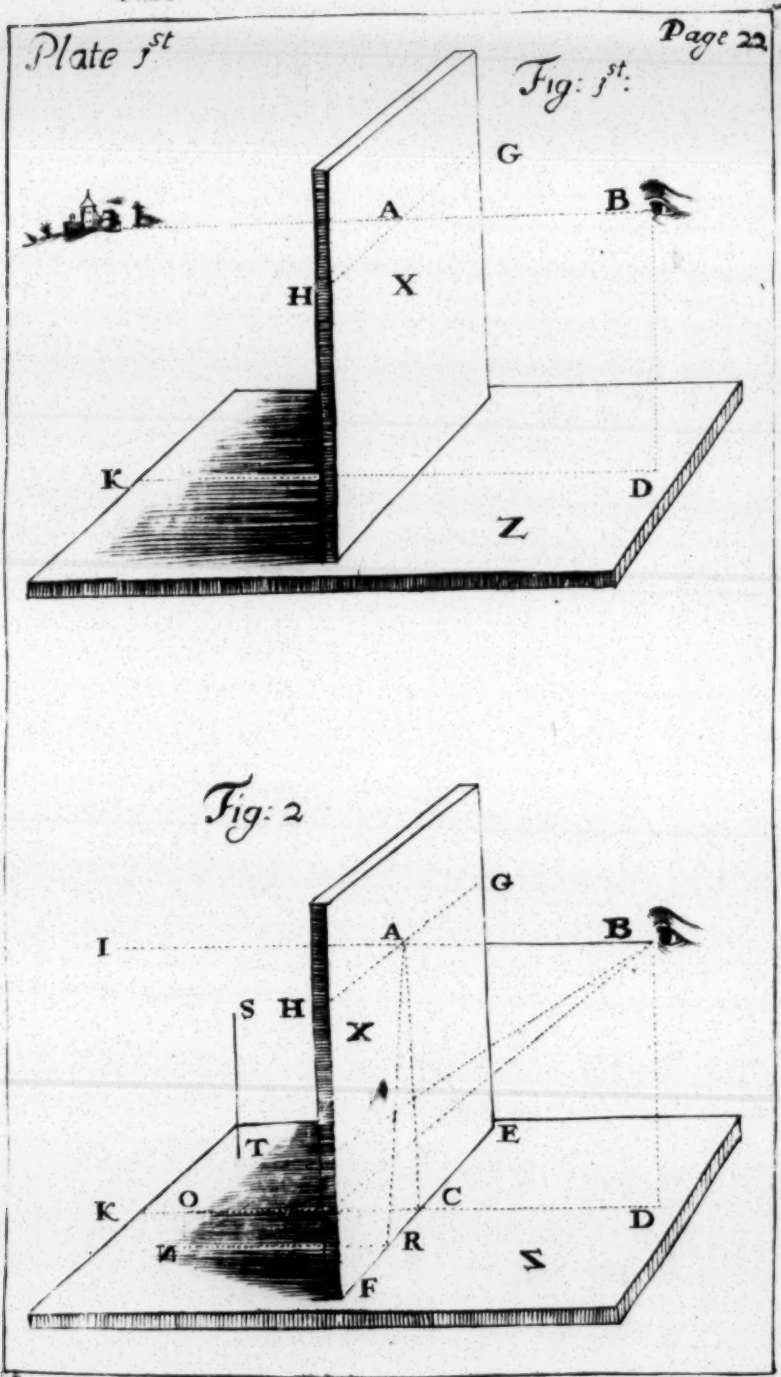
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A Treatise of Perspective. 23

DEF. VI.

The Base of the Picture, or the Line EF, which is the common Section of the Picture and the Geometrical Plan, is called the Ground Line.

Those that will not use this Term, call this Line no otherwise but the *Base of the Picture*.

DEF. VII.

N being the visible Object, and NR the distance of the Picture, the Point R on which NR falls, is called the Point of Incidence.

The Situation of an Object on the *Geometrical Plan*, depends on its distance from the *Picture*, and from the *Vertical Line*: So it is the Lines NO and NR, that determine this Situation. Some call the Line NR the *Longitude*, and NO the *Latitude* of N.

DEF. VIII.

The Seat of the Objects, is the perpendicular Support that each of its parts hath on the Geometrical Plan.

So the Perpendicular ST is the *Seat* of the Object S.

24 *A Treatise of Perspective.*

DEF. IX.

The Points of distance of the Eye from the Picture, are two Points in the Horizontal Line, equally distant on each side from the Point of sight, by the length of the Principal Ray.

To find the Perspective of a Point, mark on the Horizontal Line, on both sides the *Principal Point*, the distance from the Eye to the *Picture*.

Mark, likewise, on the *Ground Line*, or on a Line parallel to it, the distance from the *Picture* to the Object that is to be put in Perspective, by two Points equally distant, from a third where falls a Perpendicular. This will be easily comprehended when we come to the Practice.

An EXPLICATION of some Terms not belonging to Perspective, yet often used in speaking of this Science.

As *Perspective* is often used in representing Works of *Architecture*, so the Terms of *Ich-nography*, *Orthography*, *Elevation* and *Profile* (which are proper only to *Architects*) are sometimes used. The first is a Greek word, and signifies properly the Figure or Print which

A Treatise of Perspective. 25

which the sole of the Foot leaves on the Ground, which the *Greeks* call *Ichnos*. Amongst Architects it is the Section of a Building cut Horizontally near the Ground. 'Tis likewise what we call a Plan. So the Plan or *Ichnography* of a Church, is the mark left by this Church, if it had been raz'd; or the first appearance in Building, when the Foundation is ready to appear above Ground. The *Ichnography* of a Cube, or Gaming Dye, is a Square; and that of a right Cilinder is a Circle.

In the Terms of *Perspective*, *Projection* is a certain view according to the Situation of Bodies, whose Description is drawing on a Plan such as they would appear, if the Eye were in a certain Point.

Orthography or *Elevation*, is the representation of a Building, as to its breadth, thickness, heights and depths; generally it is all can be seen at a single view, supposing the Eye infinitely distant, or greater than the Object. *Orthography* is marked with perpendicular Lines, representing the Heights of an Edifice. This is what's understood by the word *Orthos*, which signifies *Right*.

Orthography or *Elevation*, is sometimes confounded with the *Profile*. *Profile* is an *Elevation*, but this word implies particularly the Cut of a Building, which shews the insides and

26 *A Treatise of Perspective.*

and outsides that are behind the Plan, which makes the Cut; and at the same time all that is cut by the Plan, as the thickness of Walls, Timbers, and all other Objects so cut, the Eye being still supposed infinitely distant. X is the *Elevation* or *Orthography* of part of a *Pilaster* with its *Cornish*; and Z is the *Profile* or *Cut* of the same part, which shews the thickness and height of its parts. It is particularly the Line which makes this Cut or Section that's called the *Profile*. *Schenography* is likewise the same thing with *Orthography*, 'tis the representation of an Object elevated on the Geometrical Plan, with its shadows as it appears to the Eye. (See Plate 2. Figure 1 & 2.)

Artificers call *Geometrical* whatever keeps its proper Measures, but Figures put in *Perspective*, and seen from a certain determined distance, change, and have no more the same Measures. In the *Perspective* of a long Gallery, the last Squares are the narrowest, and the Columns smallest and shortest; so they distinguish betwixt what is *Perspective*, and what is *Geometrical*, or betwixt a *Perspective* and *Geometrical* Representation. As for Example (see Plate 3. Figure 1, 2.) the same Column represented two ways, X *Geometrically*, and Z in *Perspective*. You see that A the *Geometrical Ichnography*, keeps both its Measures

Fig: 1

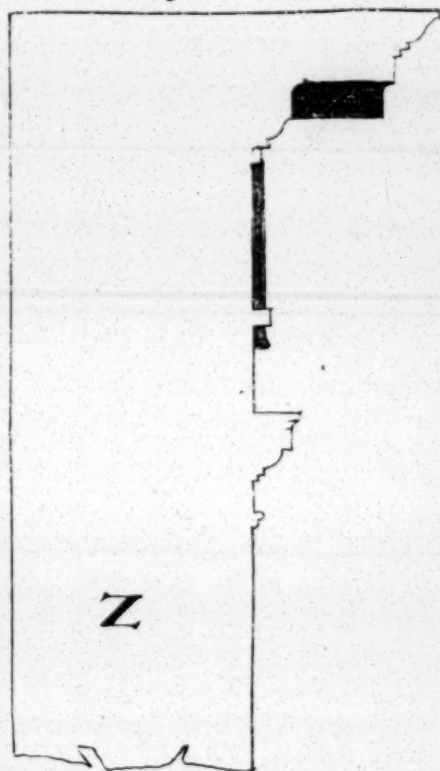
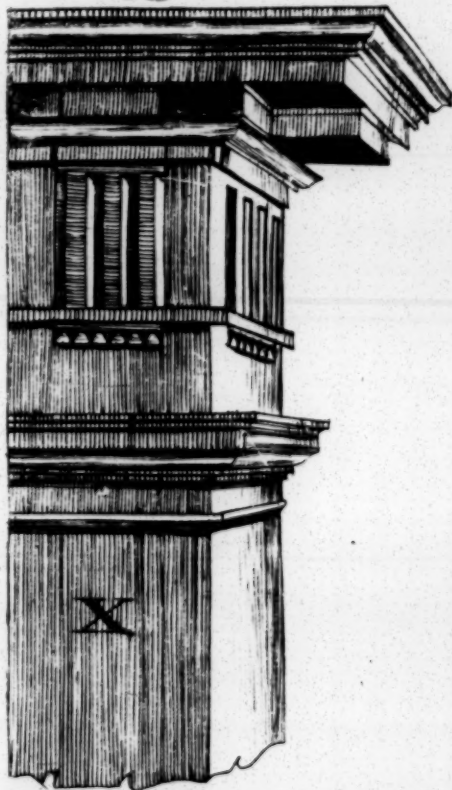


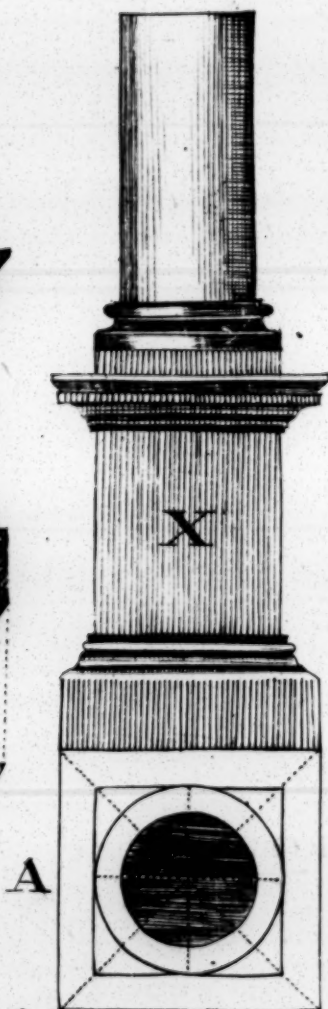
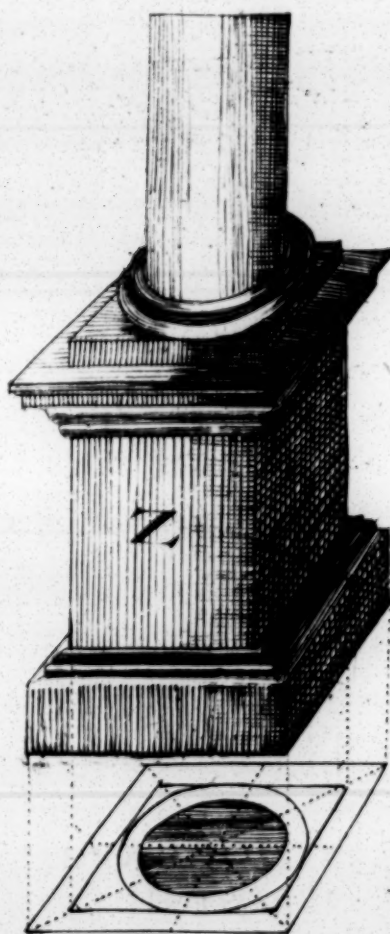
Fig: 2



The PROFILE and ORTHOGRAPHIE of
the Cornish and Capitall of a
PILASTER

A Perspective of
of the feet of a Co-
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ings.

A Geometricall
View of the same
Column



A Perspective Plan: A Plan Geometricall
of the base of Z of the base of X



A Treatise of Perspective. 27

Measures and Figure ; all which is changed in the *Perspective Ichnography* B. What is *Geometrical*, may be likewise considered as *Perspective*, supposing the Eye infinitely distant ; for a Front that hath many Pillars, being seen at an infinite distance, it appears as if the Eye were exactly opposite to each of these Columns : When the distance is determined, we see several Lines tending to a single Point ; the equal parts, but more distant, become less, and shew different sides, according as they are situated in regard of the Eye. This happens not when the Eye is infinitely distant, for the different situation of the parts of the Object, in respect to the infinite distance, cannot be perceived ; it is as if the Eye were opposite to all, and all were equally distant from it.

Those who represent Fortifications, do it generally *Geometrically*, which is easiest. *M. Ozanam* calls this *Military* or *Noble Perspective*. The *Geometrical Plan* it self, on which is described the Seat of the Objects, without any change, is taken for the Picture ; which is the reason that the Seat or *Ichnography* of all pieces of Fortification, that are to be elevated, does not change, but continues always the same. The Heights continue likewise the same ; whereas in ordinary Pictures it is necessary to change the *Ichnography* in a *Perspective Plan*,
and

28 *A Treatise of Perspective.*

and to change likewise its heights in diminishing them proportionably, as they represent heights more distant from the Picture. Architects, Ingeneers and Artificers, who design their Works before they put them in execution, represent them *Geometrically*; they make little use of *Perspective*, but for general Views, and when they would shew different Faces of the same thing.

Suppositions or Postulata.

SUPPOSITION I.

• *The Eye is a Point, and every Ray is a straight Line.*

This Supposition, taken in a strict Sense, is false, for the Eye Y (*Plate 4. Fig. 1.*) hath an opening B C of a considerable bigness, where from each Point of an Object, there enters several Rayes into the Eye, which make a Pyramid B A C, of which the visible point A is the top, and B C, the overture of the Eye, is the base. The same Rayes reuniting in the bottom of the Eye, at the point D, make an opposite Pyramid, which hath the same base B C, so that there are two Pyramids, an *Exterior* and an *Interior* ;
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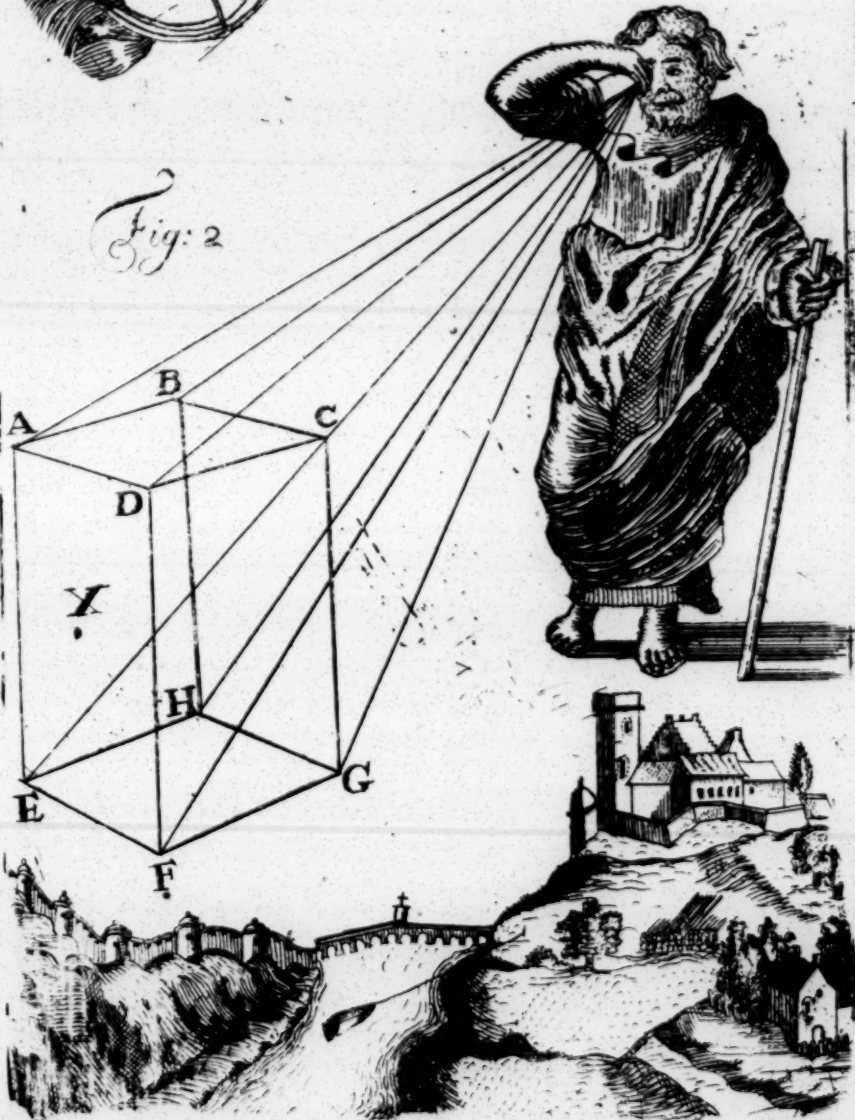
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Plate 4

Page 28



Fig: 2





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A Treatise of Perspective. 29

This is agreed to, and Experience does not allow it to be doubted of. Now tho' there enters several Rayes into the Eye, reflected from the same Point of the visible Object, the same happens as if the Eye were the Point D, and the Object A were only seen by a right Line A D, therefore our Supposition may be allowed of.

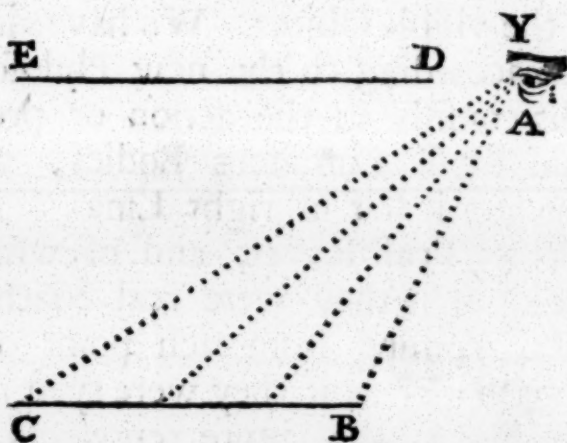
To demonstrate how the Rayes may be considered as right Lines, I have caused to be engraven the Figure of a Man, gathering and uniting in a Point at the entry of his Eye, several small Strings which come from the Angles of a Solid, (see *Plate 4. Fig. 2.*) These strings represent the Rayes which shew each point of the visible Object. We have already said, that according to the new Philosophy, the Light consists in the action or pressure of certain small Luminous Bodies, which communicates it self in right Lines. These are the Lines I call Rayes, and of which I shall speak, as if they were real Mathematical Lines, coming from each point of the visible Object; or as if they were tyed in the same manner as the Figure represents these small strings.

30 *A Treatise of Perspective.*

S U P P. II.

The Rayes by which we perceive a Line, make a Plan, if this Line prolong'd enter not the Eye.

Suppose a straight Line, such as D E, if it were placed in regard of. the Eye Y, so as that being prolonged it would enter it, 'tis evident the Eye can see but one of its Extremities, to wit, D, which is the nearest, and so it would only see it by a single Ray; but in any other situation, as in the Line B C, there comes to the Eye Y several Rayes,



which are right Lines. By the first Supposition, these Rayes make a Plan A B C, according to the Notion we have of a Plan.

Third

A Treatise of Perspective. 31

S U P P. III.

The Point in the Picture where the Ray passes, that comes from the visible Point, is the Perspective of that Point.

So P is the Perspective or Representation of N, according to the Notion we have given of Perspective, at the beginning of this Chapter, (Plate 5. Fig. 1.)

S U P P. IV.

If the visible Point touch the Picture or Perspective Plan, the Perspective of that Point is where it touches the Picture.

This is evident:

S U P P. V.

The Perspective of a right Line, which being continued, passes not through the Eye, is the Section of the Picture, and the Plan which is composed of the Rayes which come from that Line.

So the Eye B, perceiving the Line M N, by several Rayes, which make the Plan B M N, the Line P Q, Section of that Plan
B M N,

32 *A Treatise of Perspective.*

B M N, with the Picture X, is the Perspective of M. N. (see *Plate 5. Fig. 1.*)

SUPP. VI.

The Perspective of the Surface of an Object, is that part of the Perspective Plan, or Plan of the Picture, comprehended between the Perspectives of the Lines which bound this Surface.

This is evident.

Before we end this second Chapter, 'twill be proper to make some farther Reflections on the Action of the Light; whereby we shall discover important Rules in Perspective, and likewise the cause of these Rules. The Light (as we have said) consisting in the Action of certain small Bodies that press the Eye, and this Action not having an infinite force, both Reason and Experience shew, that a distant Object should strike the Eye more faintly; so that it is partly by the liveliness of the Action of the Light, that we judge of the distance or greatness of an Object; if its distance be considerable, we ought to judge it nearer to us than it is.

This is the reason that a Surface, whither *Concave* or *Convex*, appears flat and united, if seen from afar; for let the *Concave* Line
be

A Treatise of Perspective. 33

be A C D E B, (see Plate 5. Fig. 2.) and the *Convex* A F G H B, it is evident, that if these Lines be removed far from the Eye, all the various Rayes which shew the several parts of these Lines, do not work differently on the Eyes; or the difference of the Action of the longest Rayes, makes not an impression sensibly greater, than that of the action which shews the parts nearest the Eye. So that there being no sensible difference in the action of these Rayes, they appear the same to us, as if they came all from the right Line A B. The Sun and Moon, tho' Spherical Bodies, appear flat to us. That which is rugged, at a distance appears smooth; and for the same reason, what is square may appear round, when distance takes away the appearance of its Angles.

For the same cause, the *Pavement* of a long Gallery, appears higher at the Extremity, and the *Ceiling* lower. The true reason is this, Let the right Line A B represent the *Ceiling*, and D E the *Pavement* (see Plate 5. Fig. 3.) the Eye is at the point X. The Rayes of the remotest parts, strike not the Eye in a sensibly different manner, we judge therefore this Ray shorter, and consequently the part from whence it is reflected appears nearer; so the Line A B hath the same appearance as A C; and D E as B F. That

D

which

34 *ATreatise of Perspective.*

which is then in E, appears at the point F, and therefore higher than it is ; as that which is in B, appears in C, and consequently lower.

The Figure shews likewise, that the equal parts A B and D E, ought to appear unequal ; and that the most distant have the least appearance : Because the Rayes of the farthest objects pressing the Eye less, it judges not the object to be in the place where it is ; B G appears H C, and therefore less than it is. It is the same with E L, which appears as F K, so that at a distance equal parts appear unequal, and the farthest appear the smallest.

This is what Painters cannot be ignorant of. therefore in Painting of things, as they see them, they never fail to represent the most rugged bodies smooth and even, and all their parts confused, if they suppose the Eye at a great distance. They notice nothing distinctly in representing a very remote Figure. They raise whatever is below the Eye, according to the distance, and decline all that is above it. They represent, I say, all that is remote, less than Nature. This is what they call *Degradation* of a Picture.

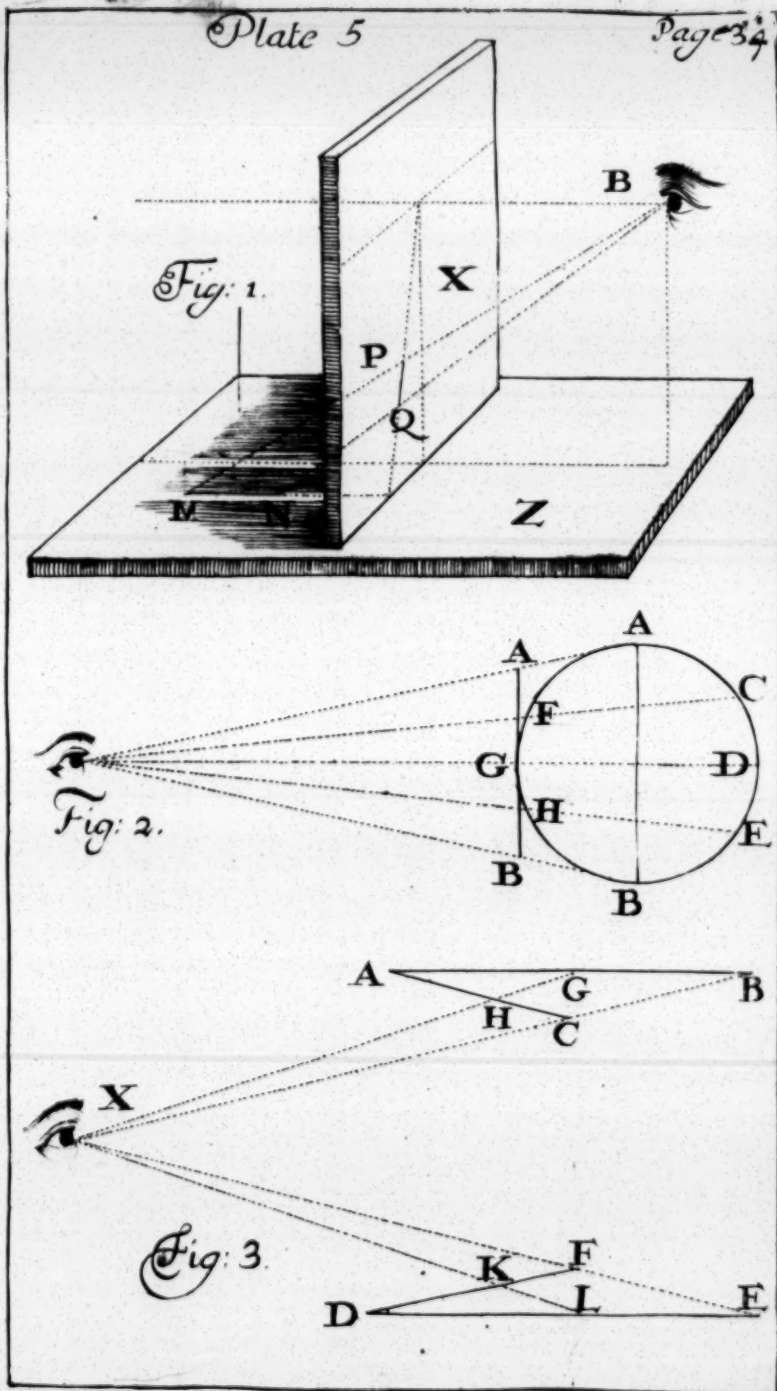
We have shewn, that it is the manner after which the Luminous Bodies strike the Optick Nerve, that makes the different Sentiments of Colour ; so that as the action of these

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A Treatise of Perspective. 35

these bodies, keeps not it self all entire, when they remove from the bodies from whence they are reflected, so they ought not to appear so lively coloured as if the Eye were near. Remote bodies appear without colour; therefore they ought to have none in a Picture, or at least it ought to be weakened; and in adjusting this faintness, lyes the Mystery of *Painting*; for tho' an object be coloured with the same colour, as to its kind, yet its parts are distinguish'd by the faintness or fullness of the same colour, according to their situation, as we shall shew more particularly in the last Chapter of this Treatise. Painters call this Diminution of the Tincture or Colours, *Aerial Perspective*; and the Diminution of Lines which represent others remote from the Picture, they call *Lineal Perspective*. It is this only I have undertaken to treat of. Nevertheless I shall have occasion to reduce *Aerial Perspective* in some measure under this Head, and touch lightly upon it.

Many advance for an Axiom, a Proposition which on several occasions is false, and capable of causing us to commit great Mistakes in the Practice of *Perspective*. They pretend, that things seen under equal Angles, have the same appearances, or appear of an equal size; from whence Father *Tacquet* concludes, that if a Statue, or right Line, appearing equal

36 *A Treatise of Perspective.*

to B C, (see *Plate 6. Fig. 1.*) were erected on the Column B D, then a Line drawn from D to A, and the Arch *e f* taken equal to *b d*, the line A E drawn through *f*, would give the line D E, which in appearance would be equal to B C, because seen under an equal Angle.

This Proposition holds not always true, it holds when the objects are near; but at a distance things of the same bigness have different appearances according to the variety of the Estimate we make of their distance. For since we see in a right Line, objects seen under the same Angle must appear so much greater, as they are judged to be distant. We may be said to have within us, a kind of Natural *Trigonometry*; for when we view an object, there is a Triangle form'd by the Rayes of that object, and the distance of our Eyes; which being known with the two Angles of the situation of the Eyes, determines the sensation of the remoteness of the object. But the Interval of our Eyes is too small a base, to judge of the distance of remote bodies; because the Eyes change not sensibly their situation, to see an object at a thousand Paces, or to see it at 100000. Wherefore we cannot judge of the distance of objects by Natural *Trigonometry*, but by the apparent bigness of interposed bodies.

There

A Treatise of Perspective. 37

Therefore the Sun and Moon appear much less, and nearer to us, when we see them above our Heads, than when we see them on the edge of the Horizon. I shall add nothing more here, referring the Reader to what Father *Malbranche* hath said in his *Search after Truth*.

To demonstrate the falsehood of this Proposition, which Father *Tacquet* takes for an Axiom, That what is seen under the same Angle, appears equal. Suppose the Eye to be in A (see *Plate 6. Fig. 1.*) and a Statue to be erected on the Column B D, that according to him should appear equal to B D. If the Angle $\angle B A d$ were of 45 deg. it behooved, according to the pretended Axiom, that the Angle D A E were equal to the Angle $\angle B A d$, to the end that D E might have the same appearance as D B; but 'tis not possible, in this case, that these Angles can be equal, tho' D E were prolong'd *ad infinitum*; for A g being supposed parallel to B E, the Angle D A E must be always less than the Angle B A D, which is supposed of 45 degrees. But allowing it to differ a little, even then D E would be almost infinite. Nevertheless, according to this Axiom, it should appear less than B D, which is contrary to experience. We shall see in the sequel, what may be done in placing an object in a high place,

38 *A Treatise of Perspective.*

and preserving the appearance of its natural bigness.

Before we finish this Chapter, we must examine a Difficulty that some make against this Supposition; That the place from whence the Picture ought to be seen, is but a Mathematical Point. They are deceived, say they, who consider the visual Point as a real Point; because the two Eyes that see, are not one Point. What shall we answer to this Difficulty? Why, in the first place, those that examine a Picture nicely, use but one Eye. In the second place, The small Interval that is betwixt the two Eyes, may be taken for a single Point, in respect to the remoteness at which the Picture ought to be seen.

Others answer, That they see but with one Eye; That the two Eyes act only alternatively; That one alone sees; and that for the Ocular Point, or place from whence the Picture is seen, may be supposed a single Point. They go upon Experiments, which if tryed, shew the quite contrary. For let X be a black Ball, (see *Plate 6. Fig. 2.*) and Z a white Table, if the Eye B be shut, and the Eye A used, it shall see X in D, as B will see it in C, if it look to X alone; now the two Eyes A and B being open, they see X in E; which I have tryed several times.

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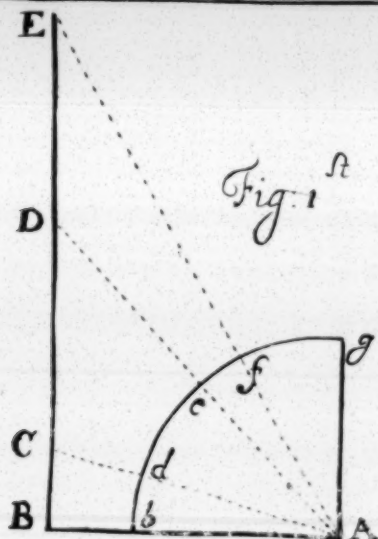
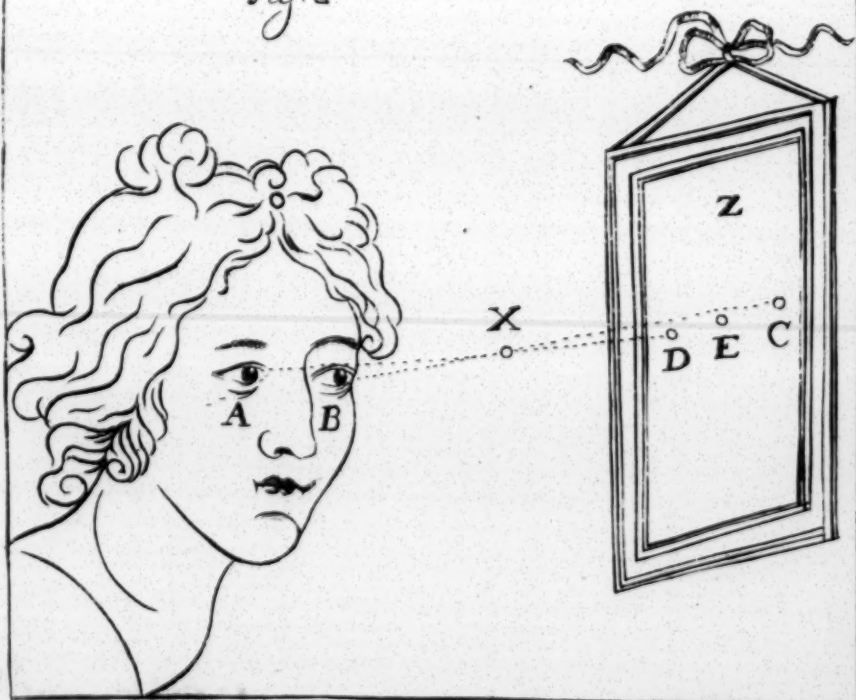


Plate 6

Fig. 5





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A Treatise of Perspective. 39

It is not then true, that one Eye only acts; or that we see only with one. But as I have said, this hinders not, but that we may suppose, the Point of sight, to be truly a single Point; that is to say, that the two Eyes of him who is in a place, from whence the Painter would have him consider his Picture, may be taken for a single Point. A Picture seen too near, hath not the Effects it ought to have; and at a distance, the Interval of the two Eyes is as nothing in respect of the Picture; as experience shews, in what we have been saying; for if the Ball X be at a great distance from the Eyes, and near the body Z, which ever Eye is shut, or kept open, whither the object be beheld with one or both Eyes, the right or the left, X shall still be seen in the same point of the Table Z, without any sensible difference.

C H A P. III.

*Of the Properties of the Section
of two or more Plans, which
meet or cut one another.*

Perspectives are the Sections made by the Plan, of the visual Rayes with the Picture; consequently it is necessary to call to mind the Properties of Sections of Plans. I shall here propose these Properties, but I shall not meddle with the Demonstrations, because they are to be found in the first Section of the fifth Book of the *Elements of Geometry*, which I have publish'd. I cite the Propositions of that Book, and those of *Euclide*, where these Demonstrations are; but it is not necessary to have recourse to them, for the inspection of the Figures is sufficient to demonstrate these Propositions, so as to be perswaded of them.

P R O P O S I T I O N I.

*A Right Line cannot be partly in the Air, and
partly in a Plan.*

This Proposition is the sixth of the fifth Section of my *Elements of Geometry*, and the first of the eleventh Book of *Euclide*.

C O R O L.

A Treatise of Perspective. 41

COROLLARY.

A Right Line piercing a Plan, cuts it but in one point.

For if it cut it in two points, it must be all in the Plan; otherwise part of it must be in the Plan, and part of it in the Air, which is contrary to the first Proposition.

PROP. II.

All Triangles may be imagined in a Plan.

This is the 8th Prop. of the forecited Section.

PROP. III.

The common Section of two Plans, is a Right Line.

This is the 14th Prop. of the 11th Book of *Euclide*, and the 9th in the forecited Section.

PROP. IV.

When two Plans, Z and X, cut one another; if the Line E D perpendicular on A B the Section of Z and X, be perpendicular on X, all the Plan Z is perpendicular on X.

This is the 12th Prop. of the same Section
(see Plate 7. Fig. 1.)

PROP.

42 *A Treatise of Perspective.*

PROP. V.

Between two parallel Lines, or two Lines whatsoever, that are in the same Plan, or between a Point and a Line, there can be but one Plan imagined.

This is the 7th of the 11th Book of *Euclide*, and the first Theorem of the first Section of my *Elements*.

PROP. VI.

Two Plans agreeing in three points that are not in the same line, agree intirely.

This is the 2d Theor. of the same Section.

PROP. VII.

Two lines, AC and BD, being perpendicular on the same Plan, they may be imagined in one Plan.

This is the tenth Theorem of the first Section of the fifth Book of my *Elements of Geometry*, which I cite always in this Chapter, because 'tis in that Section that I demonstrate what happens when Plans cut each other, (see Plate 7. Fig. 2.)

PROP.

A Treatise of Perspective. 43

PROP. VIII.

X and Z being two Plans perpendicular on Y, their Section A B must likewise be perpendicular on Y.

This is the 12th Theorem of the foresaid Section, and the 19th Prop. of the 11th Book of *Euclide*, (see Plate 7. Fig. 3.)

PROP. IX.

The Sections A B and C D of two parallel Plans cut by a third, are parallel lines.

'Tis the 16th Theor. of the same Section, and the 16th Prop. of the 11th Book of *Euclide*, (see Plate 7. Fig. 4.)

PROP. X.

The line C E in the Plan Z, being parallel to A B, the Section of Z and X, is likewise parallel to another line drawn on the Plan X parallel to A B.

This is the 9th Prop. of the 11th Book of *Euclide*, and the 27th Theor. of the forecited Section, (see Plate 7. Fig. 5.)

PROP.

44 *A Treatise of Perspective.*

PROP. XI.

*Z and X are two Plans which cut each other ;
AB is parallel to DF ; if the lines CD,
MO, EF, are parallel amongst themselves,
I say the Angles CAD, MNO and EBF
are equal.*

This is the 18th Theor. of the same Section
of my *Elements*, and the 10th Prop. of the
11th Book of *Euclide*, (see Plate 7. Fig. 5.)

PROP. XII.

Two lines cut by parallel Plans, are cut proportionably.

See the 17th Prop. of the 11th Book of
Euclide, and the last of the first Section of my
fifth Book of *Elements of Geometry*, where the
Demonstrations of these Propositions are to
be found, of which I would only renew the
Idea, for the more easie reading the following
Treatise.

CHAP.

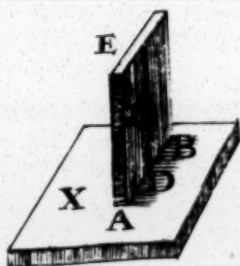


Fig. 1

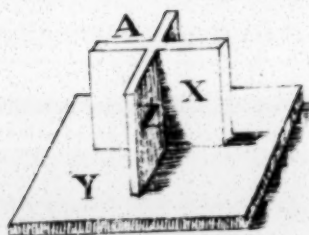


Fig. 3

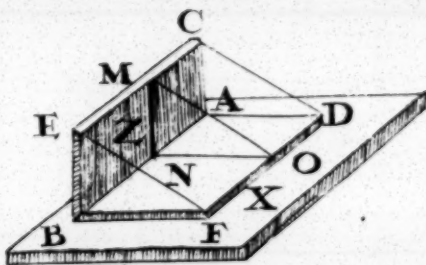


Fig. 5

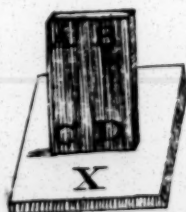


Fig. 2

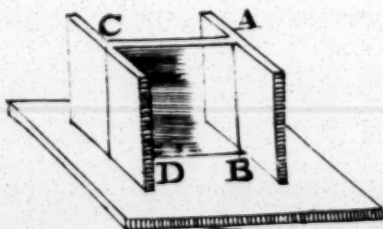


Fig. 4



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CHAP. IV.

*Of the Properties of the Sections
of a Picture, and the Plan
made by the Rayes that come
to the Eye from the visible
Object.*

THEOREM I.

The Perspective of a point, is a point.

DEMONSTRATION.

A Visible point is seen by a Ray which is a right line, Chap. 2. Sup. 1. the place where this Ray cuts the Picture, is the Perspective of the visible point, Chap. 2. Sup. 2. now a right line piercing a Plan, cannot cut it but in one point, by the Corol. of the 1st Prop. Chap. 3. therefore the Perspective of a visible point is a point.

THEOR. II.

The Perspective of a visible right line, is a right line.

DEMONSTRATION.

The Rayes by which a line is seen, that passes not through the Eye, tho' prolong'd,
make

46 *A Treatise of Perspective.*

make a Plan, Sup. 2. Chap. 2. which cuts the Picture; Now this Section (the Perspective of the right line by Sup. 5. Chap. 2.) is a right line, Prop. 3. Chap. 3. Therefore the Perspective of a right line, is a right line.

THEOR. III.

The Perspective of a line in the Geometrical Plan, parallel to the ground line, is likewise parallel in the Picture to the same ground line.

BC is parallel to FG , it must be demonstrated that DE , the Perspective of BC , is likewise parallel to FG .

DEMONSTRATION.

The right line BC on the Geometrical Plan Z , being parallel to the ground line FG , we may imagine a Plan on BC parallel to the Picture, which is elevated on GF . Now the Rayes by which the Eye A sees the line BC forming the Plan ABC ; (by Sup. 2. Chap. 2.) the common Section of that Plan, with the two parallel Plans aforesaid, give the two parallel lines BC and DE by the 9th Prop. Chap. 2. Now by the 10th, DE being parallel to BC , it must be so likewise to the ground line GF , which was to be demonstrated, (see Plate 8. Fig. 1.)

ADVER.

A Treatise of Perspective. 47

ADVERTISEMENT.

This Proposition holds, tho' the line BC be not in the Geometrical Plan, provided it can be imagined in a Plan parallel to the Geometrical.

COROLLARY.

The Perspectives of all lines parallel to the ground line, are parallel amongst themselves.

They are all parallel to the ground line, and consequently to one another, because of their being all parallel to the same line.

THEOR. IV.

Let BC be a line parallel to the principal Ray, and consequently perpendicular to the Picture, its Perspective being prolong'd, passes through the principal point, or point of sight.

DEMONSTRATION.

The line BC being supposed parallel to the principal Ray AG , (*Plate 8. Fig. 2.*) is consequently perpendicular on the Plan of the Picture X , as is likewise AG . Suppose then a Plan between AG and BC , to wit, $AGBC$ Prop. 7. Chap. 3. this Plan having the three points ABC common with the Plan ABC , shall be only the Plan ABC prolonged, Prop. 6. Chap. 3. Now the common Section of the Plan $AGBC$, with the Plan of the Picture,

is

48 *A Treatise of Perspective.*

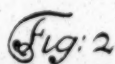
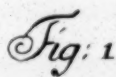
is a right line, Prop. 3. Chap. 3. such as E F, which must pass through the principal point F, because the point F must be in the Plan A G B C, as well as in the Plan of the Picture, and because the Section of the Plan A B C, and the Picture, is a part of E F, to wit, D E; then D E, Perspective of B C, being prolong'd, will be equal to E F, and consequently pass through the said principal point F, which was to be demonstrated.

COROLLARY.

The Perspectives of two or more lines perpendicular to the Picture, being prolong'd, cut each other in the same point.

This is evident, because they cut one another in the principal point; and therefore this point is call'd, the point of *Concourse*. It is likewise call'd the *Center*; and the Lines that meet there, are call'd *Radial*. These *Radial* Lines are likewise called *Fleeing*, because they seem to shun us, as we have said before, in disappearing as they approach the principal point. These Lines, if cut according to a certain proportion, serve as a Scale, on which all the Measures may be taken for finishing the Perspective. These are call'd *Fleeing Scales*, to distinguish them from *Geometrical Scales*, whose parts are equal, whereas the others are unequal.

THEOR.





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A Treatise of Perspective. 49

THEOR. V.

The Perspective of any Line which is in the Geometrical Plan, or parallel to it, if it be not parallel to the Picture, when continued, cuts the Horizontal Line.

DEMONSTRATION.

We have proved that the Perspective of a Line perpendicular to the Picture, and consequently parallel to the Geometrical Plan, on which the Picture is perpendicular, being continued, passes through the Principal Point: Now the Principal Point is in the Horizontal Line.

Let M be a Line parallel to the Geometrical Plan (*Plate 9. Fig. 1.*) but inclined on the Picture Y, the Rayes by which it is seen make a Plan, which I call X, and which ends at the Eye, by which the Horizontal Plan passes, which I call K. Thus the Plan K will cut the Plan X. I call O the Perspective of M, which being prolong'd, passes through the common Section of X, of K, and of Y, and consequently through a point of the Horizontal Line B C, which is the Line where the Horizon cuts the Picture. So the Perspective of all Lines parallel to the Geometrical Plan, perpendicular or inclining on the Picture, being prolong'd, cut the Horizontal Line; *which was to be demonstrated.*

E

THEOR.

50 *A Treatise of Perspective.*

THEOR. VI.

Two Lines parallel to each other, and to the Geometrical Plan, provided they be not parallel to the Picture, cut each other in the same point of the Horizontal Line.

DEMONSTRATION.

First, This hath been proved of Lines perpendicular to the Picture, and parallel to each other; for their Perspectives being continued, cut in the Principal Point, which is in the Horizontal Line.

Secondly, The two lines *M N* (*Plate 9. Fig. 1.*) are parallel to each other, but not to the Picture on which they incline. Their Perspectives are *OP*, which being prolong'd by the former proposition, cut the Horizontal Line *BC*. It remains then only to prove, that they cut in the same point. I call *Z* the Plan of the Rayes by which *N* is seen, and *X* of those by which we see *M*; these two Plans, *X* and *Z*, cut one another, because they both terminate at the Eye; and their Section is parallel to *M* and *N*, because these two lines are parallel, *Prop. 10. Chap. 3.* The Plan of the Horizon *K*, which passes through the Eye, cuts likewise the two Plans *X* and *Z*. Now this Section is still parallel to *M* and *N*, because it is parallel to the Geometrical Plan, *Prop. 9. Chap. 3.* then all these Sections make
but

A Treatise of Perspective. 51

but one Line which cuts the Horizontal Line B C in the same point, to wit A, which in this case is call'd *Accidental*, to distinguish it from the principal point.

COROLLARY.

Several Lines being parallel to the Geometrical Plan, and to each other, if one of these Lines, and a point of another, be known, they are all known.

For first, if these Lines be perpendicular on the picture, they meet at the principal point; so there are two points known, through which each of these Lines passes.

Secondly, If these Lines be inclining on the Picture, they meet all in the *Accidental* point, so there are still two points known, through which each of these Lines must pass.

PROBLEM.

Several Lines being given parallel amongst themselves, and to the Geometrical Plan, and inclining on the Picture, how to find the Accidental point.

It suffices to prolong the Perspective of one of these Lines; for the point where it cuts the Horizontal Line, is the *Accidental* point, where the Perspectives of the other lines meet, according to the foregoing *Theorem*.

52 *A Treatise of Perspective.*

THEOR. VII.

The Perspective of a line which is perpendicular on the Geometrical Plan, is perpendicular on the ground line.

DEMONSTRATION.

Suppose the Line BC perpendicular on the Geometrical Plan Z (see *Plate 9. Fig. 2.*) The Plan ABC , and the Picture X , are perpendicular on Z ; so their Section HE is perpendicular on Z , and therefore on the ground line FG (*Prop. 8. Chap. 3.*) Now DE part of HE , is the Perspective of BC ; therefore the Perspective of a perpendicular line, is a perpendicular, which was to be demonstrated.

THEOR. VIII.

The Perspective of one or more lines, perpendicular on the Geometrical Plan, are all parallel.

DEMONSTRATION.

By the foregoing *Theorem*, the Perspectives of lines perpendicular on the Geometrical Plan, are perpendicular to the ground line, or base of the Picture. Now it is proved in the *Elements*, that perpendiculars on the same line, are parallel amongst themselves; then by consequence these Perspectives are parallel amongst themselves.

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Plate 9

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Fig. 1

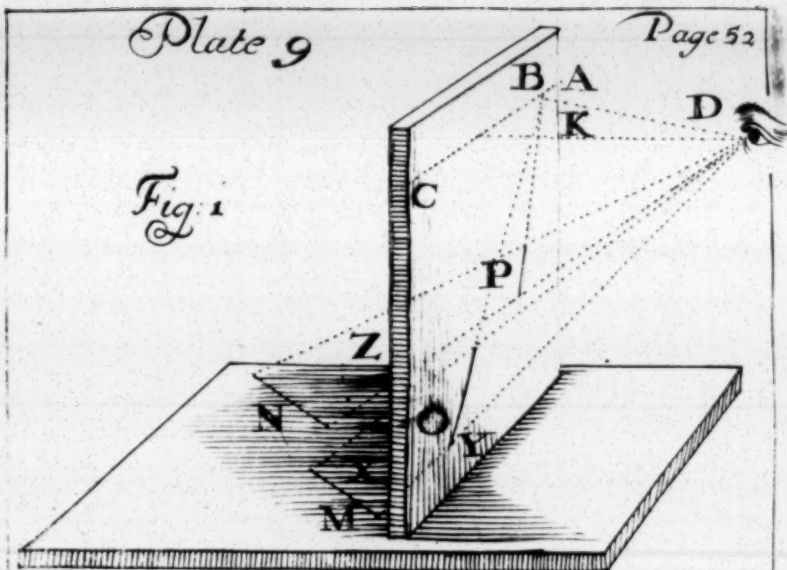
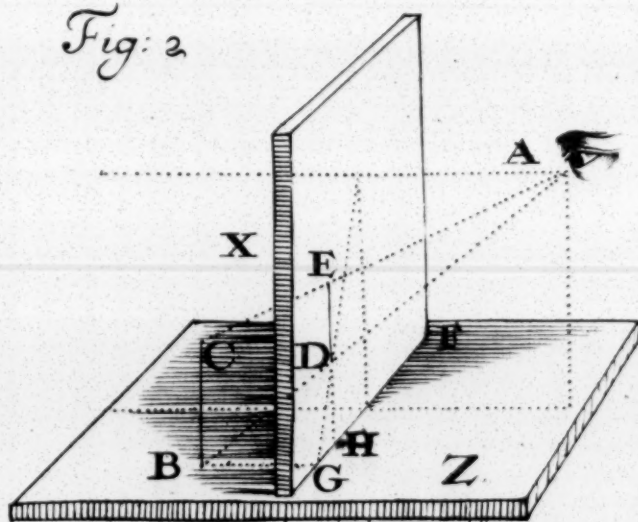


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A Treatise of Perspective. 53

THEOR. IX.

The Perspective of a line inclining on the Geometrical Plan, is inclined after the same manner on the ground line, where it makes the same Angle.

We suppose this line, which is inclining on the Geometrical Plan, to be parallel to the Picture.

DEMONSTRATION.

BC is a line inclining on the Geometrical Plan Z, its perspective is the line DE, which being prolong'd to the base of the Picture HI, I say DG makes the same Angle on HI, as BC on Z, (see *Plate 10. Fig. 1.*) BC is supposed, as I have said, parallel to DG, having then taken GF equal to BC, CF must be parallel to BG; and so the Angle DGI, or FGI, is equal to CBL, according to what hath been demonstrated in *Prop. 11. Chap. 3.*

COROLLARY.

The Perspectives of lines equally inclining on the Geometrical Plan, are parallel.

These lines are all supposed parallel to the Picture.

By the preceding Demonstrations they make the same Angle on the ground line, and consequently they are parallel, according to what hath been shewn in the *Elements of Geometry.*

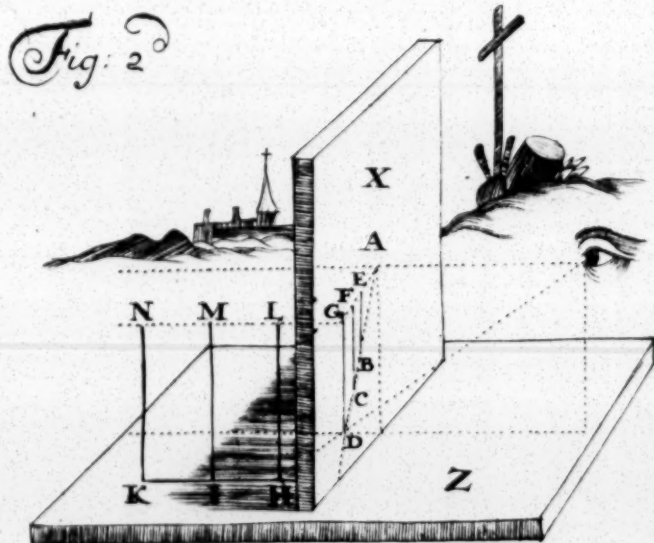
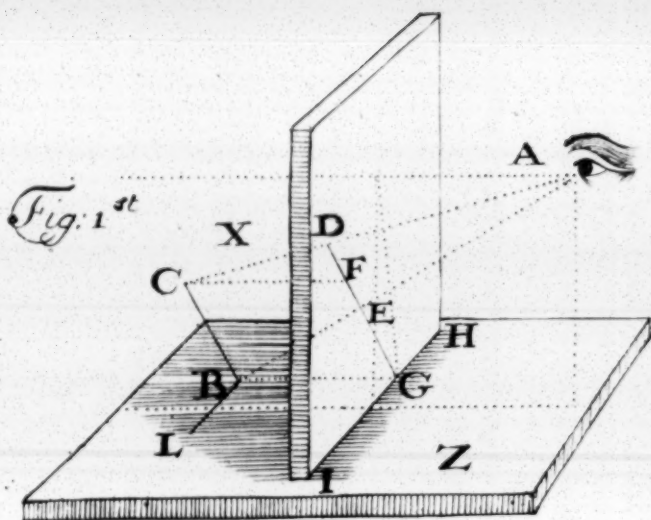
54 *A Treatise of Perspective.*

THEOR. X.

Two or more equal lines being perpendicular, or equally inclined on the same side, and on the same line perpendicular to the Picture, their Perspectives are betwixt two lines, which terminate at the Principal Point.

DEMONSTRATION.

Fig. 2
p. 10
Let there be on the same line H K, the equal lines L H, I M, and N K perpendicular or equally inclin'd, the Perspective of H K, is in the line D A, which terminates at the principal point A (*Theor. 4.*) then the Perspectives of the points H I K, common to these lines, and to the line H K, are in A D, at the points D, C, B; and because H L, I M, and K N are equal, perpendicular, or equally inclin'd, on the same side, their tops must be in one line perpendicular to the Picture, to wit in L N, whose Perspective is in G A, which terminates at the principal point A (as by the same *Theor.*) and consequently L, M, N; the tops of these lines and common points to the line L N, are in the line G A, to wit, at the points G, F, E; which was to be demonstrated, (see *Plate 10. Fig. 2.*)





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A Treatise of Perspective. 55

COROLLARY.

Several lines being given, equal and perpendicular on the same line as on HK, after having found the Perspective of the first line HL, and the top or base of the others, the rest is easily found.

For the Perspectives of these lines are parallel (*Theor.* 7 & 8.) then by drawing parallels to the line DG, the Perspective of HL, by the points D, C, B, or G, F, E, between AG and AD, the Perspective of HL, IM, KN, are found.

THEOR. XI.

The Perspective of a line being a line; I say, the parts of the Perspective of a line parallel to the Picture, are proportionable to those of the line, whose Perspective it is.

Suppose BD parallel to the picture X, and divided in the point C (*Plate 11. Fig. 1.*) its Perspective is EF; so E is the Perspective of B, F of D, and G of C. Now EF is parallel to BD; therefore as DC is to CB, so is FG to GE.

COROLLARY.

If the parts BC and CD of the line BD are equal, the parts EG and GF of the Perspective EF, are likewise equal.

• This is evident.

56 *A Treatise of Perspective.*

THEOR. XII.

The Perspective of a Figure, parallel to the Plane of the Picture, is similar to that Figure.

DEMONSTRATION I.

The Angles comprehended between the sides of the Figure, are equal to those of the Perspective, because all the lines of the Perspective make the same Angles with the ground line, as those made by the Lines of the Figure, (*Theor. 9.*) So the Figure of the Perspective is similar to the visible Figure.

DEMONSTRATION II.

The Rayes that come from this Figure to the Eye, make a Pyramid, of which this Figure is the base. The Picture is supposed parallel to this Figure ; therefore its Section with the Pyramid is likewise parallel to this Figure, and consequently similar, as is demonstrated in my *Elements*. Now this Section is the perspective of the said Figure, therefore the Perspective of a Figure parallel to the Picture, is similar to that Figure.

COROLLARY I.

The Perspective of a Square or a Circle, &c. parallel to the Picture, is a Square or a Circle.

This is a necessary Consequence, because in this case the Figure of the Perspective is similar to the visible Figure.

CO.

A Treatise of Perspective. 57

COROLLARY II.

The Perspective of the parts of the Front of a piece of Architecture, that are on the same line, keep the Proportions of the parts of the said Front.

COROLLARY III.

Any part of the Perspective of a piece of Architecture, or its Diminution, being known, the rest is easily found.

Make only a Scale of Diminution. If (for instance) the *Architecture* is diminished half in the Perspective, then take half of each part.

THEOR. XIII.

The Perspectives of equal parts of a Line, perpendicular to the Picture, are unequal.

Suppose *BE* a line perpendicular to the *Picture*, and divided equally by the points *C* and *D* (*Plate II. Fig. 2.*) the Perspective of this line is *FG*; which we must prove not to be equally divided.

DEMONSTRATION.

If *BE* and *FG* were equally divided, then they would be parallel; but since *EB* is perpendicular to the *Picture*, in the Plan of which is *FG*, they cannot be parallel; therefore not being divided according to the same Proportion, the parts of the Perspective *FG*, cannot be equal, as those of *BE* are: *Which was, &c.*

LEM-

58 *A Treatise of Perspective.*

LEMMA.

The base BE of the Triangle ABE , being divided into equal parts; I say First, of the Angles of which the equal parts are the Bases, the highest are the least: Secondly, in the Triangle FAG , the base FH of the superior Angle, is less than HI the base of the inferior.

DEMONSTRATION.

First, The lines AB , AC , &c. (Plate II. Fig. 2.) become longer as they are more distant from the perpendicular AM . So AE shall be greater than AC . Then if the angle EAC were equally divided, *Euclide, Book 6. Prop. 3.* $AE, AC :: ED, DC$; then ED would be greater than DC ; but being supposed equal, the superior angle EAD ought to be smaller than DAC , or FAH than HAI , and so of the rest.

Secondly, All lines, as AF , AH , &c. as they are more distant from the perpendicular AP , become longer; so AF shall be less than AI . If then in the triangle FAI , the angle A be parted equally, *Euclide, lib. 6. Prop 3.* $FH, HI :: FA, AI$. Then FH would be less than HI , for that reason, and because the angle FAH is less than HAI ; which we have demonstrated (Plate II. Fig. 2.)

THEOR.

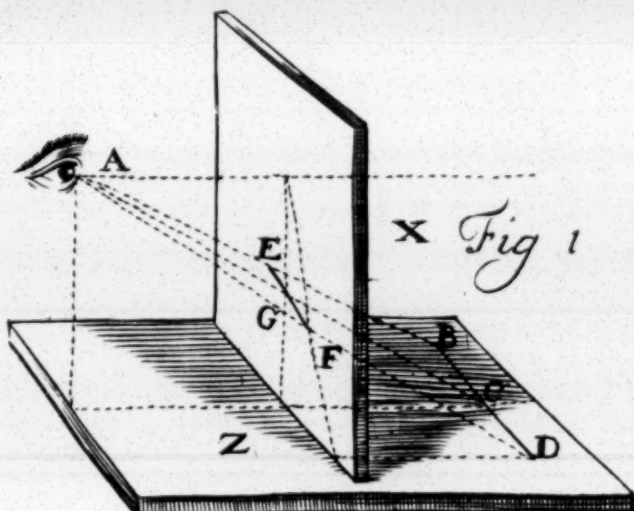
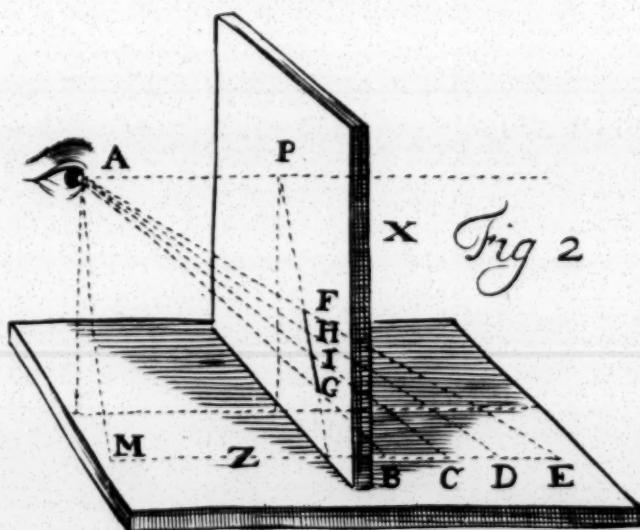


Plate ii



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A Treatise of Perspective. 59

THEOR. XIV.

The Perspectives of the parts of the line B E (the same Figure, and the same Case, as in the foregoing Theorem) that are remotest, are smallest.

This has been proved in the foregoing Lemma.

THEOR. XV.

The farther Objects are from the Picture, their Perspectives are the smaller.

If the line B E were infinitely prolong'd, and still divided in equal parts (*Plate II. Fig. 2.*) the last of these parts would have the least Perspective. So the Perspective of that object which is the base of the same angle in the *Picture*, is lesser. It is evident (*same Figure*) that if the Eye A draw back from the *Picture* X, or if B E be plac'd at a greater distance; as the Rayes A B and A E grow longer, the angle B A E becomes less; and the second base F G Perspective of B E becomes shorter. *Which was, &c.*

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60 *A Treatise of Perspective.*

COROLLARY.

In removing the Eye too far from the Picture, or in representing Objects at too great a distance on the other side the Picture, all must be confused.

For instance, in the Perspective of a too long row of Columns, all the Columns must be confounded. This depends particularly on the situation of the Eye, in regard of the Objects. The Eye and the Objects being determined in their situation, the *Picture* may be nearer or farther from the Eye. When it is nearer the Eye, the Perspective is really less; and the contrary when it is more remote, tho' the Object appear still of the same bigness, and under the same angle: For 'tis the distance from the Object to the Eye, that makes the different Sensation, and not the *Picture* which changes not the Sensation, be it near or far from the Eye.

THEOR. XVI.

The Perspective of all Objects placed lower than the Eye, is below the Horizontal Line; but above the Horizontal Line, if the Objects be placed higher than the Eye.

DEMONSTRATION.

Suppose B an Object below the Eye A
(*Plate 12. Fig. 1.*) seen by the Ray A B, the
Horizontal

A Treatise of Perspective. 61

Horizontal line is *EF*, and the principal Ray *AD*, parallel to the Geometrical Plan. If *B* were drawn back infinitely, the Ray *AB* could never reach the Horizontal line *EF*; because it ought first to be parallel to *AD*, and then *B* would not be below *EF*, or *AD*, as it is supposed to be situated.

Let *C* be a visible point above *AD* or *EF*, the line *AC* shall never reach *EF* for the same reason; and consequently the Perspective *C*, shall not be found below *EF*. (*Which was, &c.*)

THEOR. XVII.

The Perspectives of Objects that are below the Eye, are higher, the remoter the Objects be; and those of Objects above the Eye, are lower, the remoter they be.

DEMONSTRATION.

It is evident, that the farther *B* is removed, the Ray *AB* draws nearer the line *AD*, which is the principal Ray, (*Plate 12. Fig. 1.*) and so cutting the *Picture* nearer the Horizontal line *EF*, the Perspective of *B* becomes higher: So that the more *C* is removed, the Ray *AC* drawing near or descending to *AD*, cuts the *Picture* nearer *EF*; and consequently the Perspective descends nearer

62 *A Treatise of Perspective.*

nearer to the line E F. I do not mean that C should be remoter by prolonging the Line A C, for then its Perspective would be still in the same point E, tho' it were infinitely prolong'd; but so as the Object, whither near, or at a distance, shall be still at an equal height above the Horizontal Line.

THEOR. XVIII.

The Perspective of a Point of an equal height with the Eye, or Horizontal Line, is always found in the Horizontal Line.

This is evident; for the Ray or Line that comes from that point to the Eye, is parallel to the Geometrical Plan, on which it hath two points equally elevated. 'Tis therefore likewise parallel to the Horizon; and passing through the same point to wit the Eye, it must necessarily cut the Horizontal Line.

COROLLARY.

Consequently if several Figures on the Geometrical Plan, were of the height of the Eye, or of the Horizontal Line, the Perspectives of their tops would be all found in the Horizontal Line.

This is clear.

THEOR.

A Treatise of Perspective. 63

THEOR. XIX.

A Point being given in the Geometrical Plan, if a perpendicular be drawn from this Point to the Picture, and from the same Point a line be drawn parallel to the Picture, the Perspective of that Point, will be the Point of Section of the Perspectives of these two Lines.

DEMONSTRATION.

The Point given in the Geometrical Plan, whose Perspective we look for, let it be the Point A, (*Plate 12. Fig. 2.*) draw the Line A B perpendicular to the *Picture*. G is the Principal Point. Then by the (*4th Theor.*) the Perspective of A B, and consequently of A, part of A B, is in the line B G.

Suppose A H a line parallel to the base of the *Picture*, passing through the point A, whose Perspective we look for: Suppose likewise F E to be the Perspective of A H, which Perspective is parallel to the base of the *Picture*, *Theor. 3.* Now A is in the parallel A H, and in the perpendicular A B, so that the Perspective of A, which is in the Perspective of these two lines, is certainly in the common Section of B G, and E F, the Perspectives of A B and A H: *Which was, &c.*

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64 *A Treatise of Perspective.*

COROLLARY.

Having thus found the Perspective of the Line parallel to the Picture, where A the visible Point is; draw from its point of Incidence, a Line to the Principal Point, and the Perspective of A is found.

For the Point of *Incidence* of A, according to the Definition (*Chap. 2. Def. 6.*) is the Point where the Perpendicular falls, that is drawn from the visible Point to the Picture. Now the Perspective of the visible Point, is in the Perspective of that Perpendicular; and so in the common Section of that Perspective, with that of the parallel Line that passes through the visible Point A, in the Geometrical Plan.



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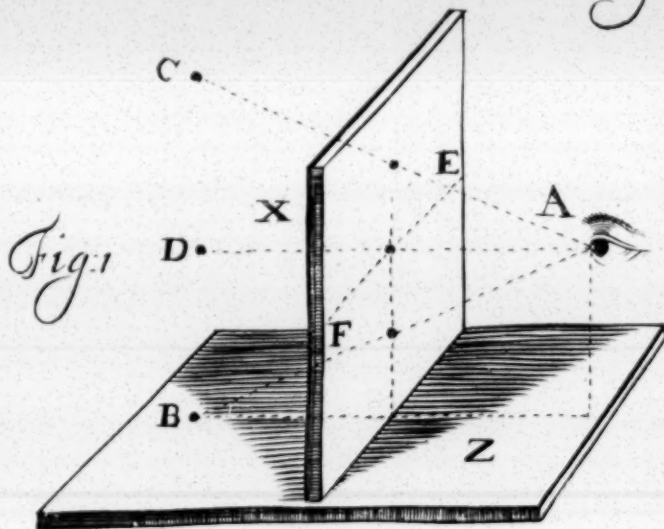
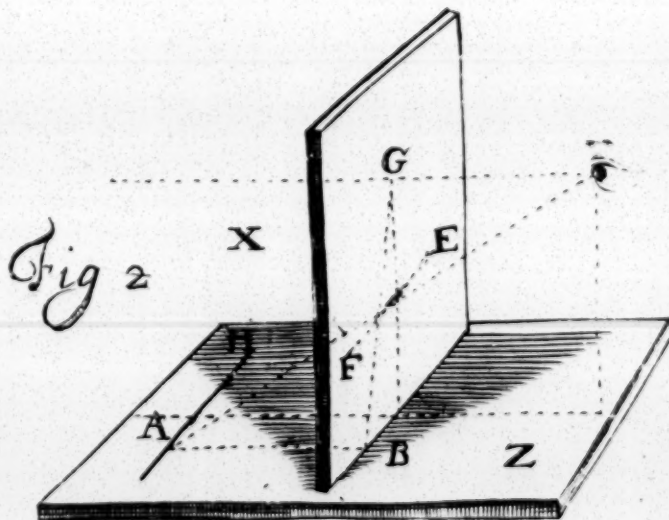


Plate 12



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CHAP. V.

Of the Disposition of the Objects design'd to be represented; and of the Situation of the Picture, or Perspective Plan, with relation to those Objects, and to the Point from whence it ought to be seen.

THE Art we here treat of, consists in finding in a Picture, the passage of the Rayes, which would shew the Objects that are behind it, if it were transparent. Before we search for this passage, we must consider which is the situation of the *Picture*, with relation to the Objects we would represent, and to the point of sight, from whence it ought to be seen. This will make three Heads, which shall be the subject of this Fifth Chapter.

I.

Of the Disposition of the Objects on the Geometrical Plan.

What the ordinary Painters do by chance, and at random, he that is a Geometrician can
F do

66 *A Treatise of Perspective.*

do artfully and precisely. We have already said, that every Picture is supposed to be on a Geometrical Plan, and that it is there, *Vertically* or *Perpendicularly*, if it be not mentioned to be in another situation. We have likewise supposed the Geometrical Plan to be Horizontal, that is to say, parallel to the Horizon. 'Tis on a regular Plan, that we ought always to conceive the Objects, whose Perspective we search after, to determine and measure their just Situation, in regard to the *Picture* and point of sight.

Altho' the subject be given, and that it doth not depend on the Painters choice, he may imagine it under the finest Form it is capable of, in which he shews his Ingenuity. The Features and Colours are the Materials, which can only express the body of the subject; the Disposition we speak of, paints what the Senses cannot perceive; and this is called the Spiritual part of *Painting*. But 'tis not my business to explain this Disposition, because I talk of *Painting*, in so far as it borrows the help of the *Mathematicks*, to determine in the *Picture*, the place where each thing should appear.

When the Subject is great, and contains several things, the Imagination is not strong enough to comprehend them all, in the Disposition in which it is desired they should appear.

A Treatise of Perspective. 67

pear. He must at least have some help to fix and support his Imagination, and to keep it still lively, for such a time as is necessary for a Painter to express with his Pencil and Colours, what it represents to him. Therefore it is, that those who desire to succeed, make use of this Artifice: They dispose on a sort of Theater all they would represent; after which they take their Measures, their height, their distance from the *Picture*, and from the Eye of the Spectator. They mark their Situation on the Geometrical Plan, with relation to the base of the *Picture*, and to that Vertical Line which is the Section of the Geometrical Plan, and of a Vertical Plan, which passes by the Principal Point of the *Picture*.

The thing is neither so long, nor so difficult, as it appears; it may be made easie. To that end we must imagine the Geometrical Plan to be a Square divided into several other small Squares, by the help of which, the place of each Object, and the *Ichnography* or Plan of the whole subject is determined. This Plan cannot be made, without searching the point of *Seat* of all that is above the Geometrical Plan. That is to say, it must be found in what point of this Plan, or in which of these little Squares that divide it, a perpendicular line falls, from the point of the

68 *A Treatise of Perspective.*

Object which is in the Air. 'Tis this Perpendicular that measures the height of that point.

If (*for instance*) it were desired to put a Statue in Perspective, according to the Rules; to find the Perspective of its principal points, we must consider which is the Situation of its Foot, and after that of the upper parts, by letting fall a Plummets, which gives their point of *Seat*.

Let us make this more intelligible by some easie Example. If the Octaedre X were to be put in Perspective (see *Plate 13. Fig. 1 & 2.*) that is to say, the body X having eight sides, it must be examined where the Perpendicular lines B *a*, C *b*, D *c*, E *d*, A F do fall, which measure the height of its angles. The foot of these perpendiculars makes the Figure *a b c d*, which must be put in Perspective; then searching the Perspective of all these perpendiculars, the points A, B, C, D, E, F, are found, which being joyned by straight lines, forms the body Z similar to X.

This is neither difficult, nor very long. Now when the *Ichnography* of what you would represent, or at least of the principal things is found, all is easie, and you may work safely; for the Perspective of this *Ichnography* is easily found, in dividing (as hath been said) the Geometrical Plan in small Squares.

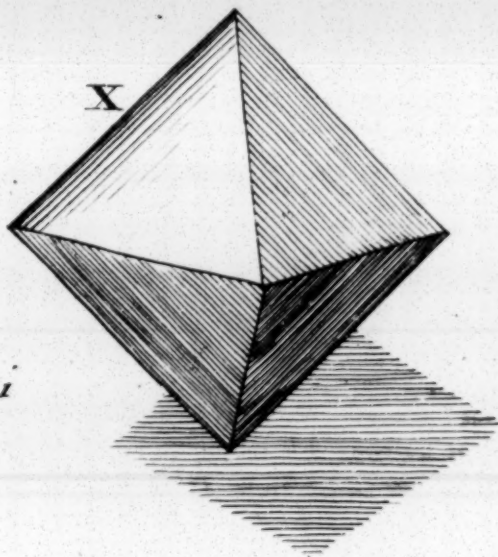


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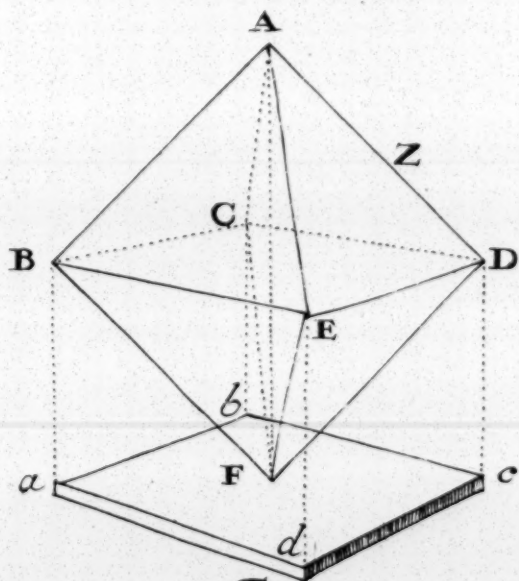
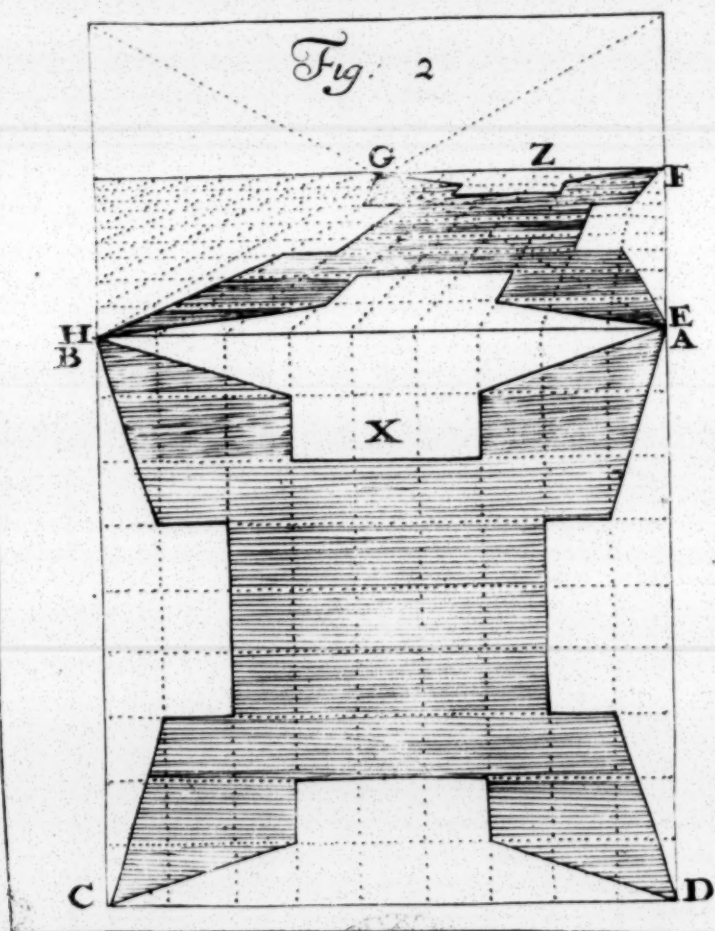
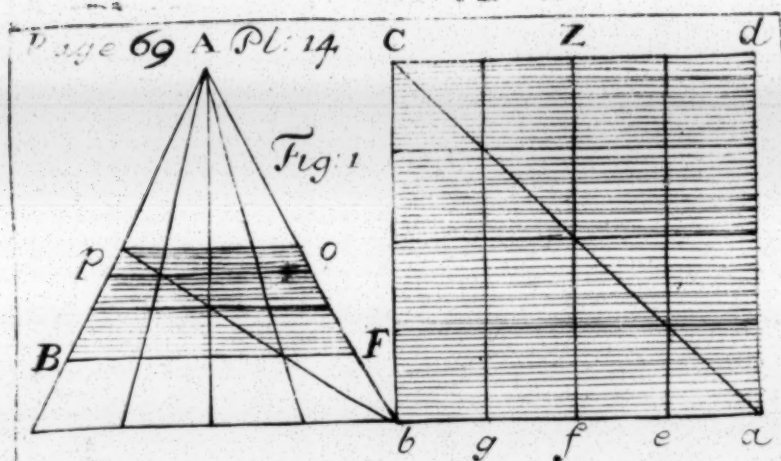


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A Treatise of Perspective. 69

Squares. The whole Plan is conceived as a Square. Suppose then *Z* or the Square *abcd* to be the Geometrical Plan, (see *Plate 14. Fig. 1.*) Divide the side *ab* in equal parts, by drawing right parallel lines by the points *efg*. Divide likewise the side *ad* and draw parallels: Thus the whole Square will be divided into several small Squares. The Perspective will be found by the Operations which we shall shew in the next Chapter. This Perspective is *B F o p*; which being found, it is easie to find the Perspective of the *Ichnography* of the subject that is on the Geometrical Plan. This may be done with an easie practice, without any sensible error, by marking in the Perspective of each small Square, whatsoever is in that Square. The sight of this figure alone makes it easily comprehended, (see *Plate 14. Figure 2.*) *X* or *ABCD* is the Geometrical Plan, on which we imagine a fortification. This Plan hath been divided in several small Squares, which contains the Geometrical *Ichnography* of this Fortification. I suppose *Z* to be the Perspective of this Geometrical Plan, and of the other Squares into which it is divided. By transporting then what is in the Squares of the Geometrical Plan, into the Perspectives of the said Squares, the Perspective of the Geometrical *Ichnography* which was desir'd, is found.

70 *A Treatise of Perspective.*

This is an admirable ready way to find what *Painters* call the *Degradation* of the *Picture*. The first Objects which are conceived behind the *Picture*, are those which are the first beyond the Ground line, or base of the *Picture*. According as they are more distant, their Perspective is raised, and at the same time gradually diminished. This may be observed without *Perspective*. Generally whatever is seen at a distance appears smaller. So a Figure, which on the base of the *Picture* ought to be five foot, may be placed at such a distance, that it can have but four, or less if what it represents ought still to be imagined more remote beyond the *Picture*. This is what I have been calling the *Degradation* of the *Picture*; which is known as soon as we have found the Perspective of all the Geometrical Plan; and of the Squares into which it is divided. We know Geometrically the Diminution of each Object, as it is placed in such or such a parallel of the Geometrical Plan; for instance, How much a body of five foot, which is in the second parallel line of the Geometrical Plan, should appear diminish'd in the *Picture*; and how much in the third; and consequently what is the *Degradation* of the *Picture*, or by how much must the natural size of the Object be diminished, according to the place where its

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A Treatise of Perspective. 71

Perspective is put. This being as easie as it is necessary, *Painters* that neglect it are much to blame. And can do nothing well but by chance.

The Geometrical Plan, on which we imagine the Objects we would represent, may comprehend a great Country. But every thing may be reduced from great to small; and we may suppose a Board or Table of five or six foot square, to be a large Country. Neither is it necessary to make effectually any Geometrical Plan, it is enough to imagine it; and without marking the lines which are the measures of the Objects which are to be painted, we may express them by number, these measures making only a Scheme of the *Picture* which is to be painted, as the *Architects*, who without drawing any line, calculate what they design to make, and make it known to the Workmen that are to execute it, marking by numbers all the measures of their Work, the size of its Plan, the length, and breadth of all the Apartments, the height of the Stories, and the largeness of the Windows. A *Painter* may likewise prepare his subject in his fancy, and write it down; He may mark it on Paper by numbers, determining the Situation of such and such a part, how many feet it is distant from the base of the *Picture*, how much it is elevated above

72 *A Treatise of Perspective.*

the Geometrical Plan, or depressed under it, and so make an exact design.

Painters have a great liberty : All is allow'd them, providing they clash not in any thing with likelihood and decency. They may therefore imbellish and dispose things to the best advantage. I believe likewise they may take some liberty in the Designs of Perspective, which they make upon Paper to represent an Edifice, particularly when the business is only to give an Idea ; and not to finish it, but only to shew which way it is done. If the business be to make a general view, they need not confine themselves to a true Plan. For instance, if in this Plan there be found great Courts before the Entry, the Perspective of these Courts which will be upon the base of the *Picture*, shall appear too great ; whereas that of the Edifice which is to be represented, will appear too small and confused. I believe that upon such an occasion they may imagine another Plan than the true one ; that is to say, they may suppose one, such, that the parts which they would render most sensible, may appear in the design, as obvious as is necessary. They must suppose the Court of entry lesser ; and if there be any Buildings on the Wings that they would make appear, they may detach them more than they are ; that is to say, they may suppose

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A Treatise of Perspective. 73

pose the Court that separates these Buildings to be greater, to the end that in the Perspective these Buildings may not be confused. This can run them into no error, for the true Geometrical Plan, reforms and makes understood what is requisite to be known.

There may be many things observed, touching the Disposition of the Objects on the Geometrical Plan; but as I have said before, it does not concern me. I shall only add, that a *Painter* ought to suppose nothing there, but what the Eye can comprehend at a single view. We are now going to shew, that the Eye comprehends a greater or lesser number of Objects, as it moves farther off, or draws nearer.

II.

Of the Situation and Size of the Picture.

A *Picture* can represent but one single Action, or Actions that relate to one thing, and can be seen wholly at one view. The liberty of *Painters* is therefore not so great as that of *Poets*; these are indeed obliged to unity of Action, Time, and Place, whither it be in a *Comedy*, *Tragedy* or *Heroick Poem*. In *Drammatick Poesy*, or Pieces of *Theatre*, the place is the *Theatre* it self, on which all passes, or is there related if it has been acted elsewhere.

74 *A Treatise of Perspective.*

where. In *Heroick Poesy* the place is all the Provinces which the Heroes have run over in the time in which the principal Action was done, which is the subject of the Poem. The time of this Action may be a whole Year. The Pieces of *Theatre* are allowed at most but twenty four hours. *Painters* are yet more straitned, for they can only paint the Moment of one Action, the Situation where the things were in that Moment; the Figure, and the Character of the Passion with which every Personage was animated at that time. The Figure of all the Bodies, the Postures, the Visage according to the Motions of the Spirit, which being active, is continually changing all these, which is impossible to be mark'd with a single stroke of the Pencil; for the same Features cannot serve for quite different things. 'Tis then only the moment of an Action that hath its proper Features which can be painted. So the time of the Action, that is the subject of the *Picture*, is but one instant, because the next instant will require other Features; the things having no longer the same Situation, the same Disposition, nor the same Character.

Painters are likewise more straitned than *Poets* in the unity of the Action: Every *Comedy* has five Acts; and every Act hath different Scenes, in which are seen different Ornaments, changings

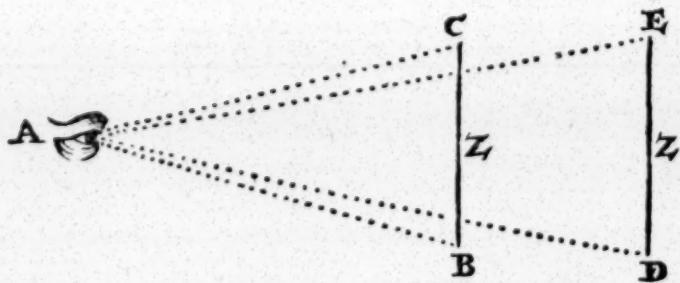
A Treatise of Perspective. 75

changings of the Scenes, and still something that is new. In *Heroick Poems* they give Battel, and besiege Towns. 'Tis not the same in Painting; as the Eye can see nothing distinctly, but what is before it, and that its overture is limited and narrow, it cannot receive but a small number of Objects at once. Besides that the Rayes that enter obliquely, cannot unite in the *Retina*, to form there the Image of the Objects from whence they come. Wherefore a thing is not distinctly seen, but when the Rayes by which it is perceived, fall directly upon the Eye, or miss little of doing so. In changing place, or turning the Eye, things are discovered that were not seen before; but a *Painter* cannot represent exactly what is not seen at a single view. There is great difference between *Sculpture* and *Painting*: A Statue that stands by it self, can be seen on all sides, and by parts; and every point from whence it is seen, hath a particular Circumference. But in a *Picture* there cannot be given to the same Figure different Circumferences, to terminate it by two different strokes. So that if, in considering an Action, the place be chang'd, or the Eye turn'd, it is seen in a different manner, and then the same Figure can no more serve; for its Circumference will not be proper for it, but when it is seen in its first Situation.

If

76 *A Treatise of Perspective.*

If we would represent different Actions to be seen at several times, we must make several *Pictures*. But finally, what Rule must we observe for the Grandure of the Action that is the subject of the *Picture*; or what size must we allow the *Picture*? To find this Rule, let us reflect on what we have been saying, that the Eye sees not distinctly but what is before it; and that it is but little affected with what enters it slanting. Likewise the Eye rows in the Head, and turns it self to what it would see; it draws near, or retires to see better; for as this Figure makes plain, while the line Z is betwixt D and E more distant from the Eye, the Rayes by which it is seen, smite the Eye more directly, than when it is in B and C. So the



Rule we look for, is, if the *Picture* be large, and the Figures in their natural size, and in great number, we must suppose what it represents to be at a great distance; for other-
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A Treatise of Perspective. 77

ways 'tis impossible for the Eye to receive so many things at a single view. For instance, Let us consider the great Front of the *Louvre*. If we are near it, we can see but a small number of Columns, which will strike the Eye directly: Whereas in retiring to a reasonable distance, the Eye, tho' it continues fixed, comprehends easily all this great Front, which becomes smaller, and contracts it self, to be proportionable to the Capacity of the Eye. But if the distance be too great, the Objects become too small; they appear no more, and the *Picture* is all confused.

We speak here of a *Picture*, in which we would have things appear in their natural greatness; that is to say, that they make, as near as possible, the same Impression upon the Eyes, as they would do in their natural State. To determine the greatness of this *Picture*, we must have a regard to what we would have appear there. But above all things, we must remember, that it ought not to be excessive large; that it ought to be proportioned to the Capacity of the Eye, which ought to see it wholly at one view. It may be done by taking a great distance, even tho' the *Picture* were very large; but then it would in a manner disappear; all the small parts would not be seen. Now a *Picture* is not made to dazle the Eye with colours, nor

78 *A Treatise of Perspective.*

to shew strokes that cannot be distinguished at too great a distance.

Nevertheless there is no Action, whatever multitude of Actors it may have, but may be expressed in one Picture of a size proportionable to the Capacity of the Eye. There is a certain convenient distance, which hinders not from seeing what the Painter would represent. Battels and all sorts of Actions which suppose a great Multitude of Persons, may be represented, as is seen in a *Picture*, representing a Basket of young Chickens. But which is that convenient distance? We must acknowledge it a little difficult to determine justly. To speak nothing here at random, let us call to mind what we have said several times; that a *Picture* ought to be considered as a Window. According to the largeness of the Overture of a Window, and the nearness of the Eye, we perceive more or fewer Objects. If we be near, and the Objects touch the Window, it is evident that what we see, is no larger than its Overture; which gives me reason to say, that the Rule which Painters ought to follow, is, that if the subject they treat of, ought to be imagined on the forepart of the *Picture*, they can place nothing there but what the largeness of the *Picture* allows to be represented in its natural bigness; so that if they be great Histories, which

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A Treatise of Perspective. 79

which require a great number of Figures, a large place, or a Country, as the Eye cannot see so many things through a Window, if they be not at a convenient distance, so they ought not to be on the forefront of the Picture, but in the *Degradation*, and of a size much less than the natural; because every thing should diminish and decrease in proportion to its distance; and grow likewise more confused and dark. It is true, that when we are at the Window, 'tis not its Overture which limits the extent of the Objects which we may see. But as the Eye ought not to touch the *Picture*, that it ought to be at some distance, its largeness which represents the Overture of a Window, determines the greatness and multitude of the Objects which this Overture would let us see. According as we are near or far, it lets us see more or fewer Objects. So to resolve the Questions that may be made concerning the Disposition of Objects on the Geometrical Plan, and the situation and size of the *Picture*, we must consider which is the situation of the Eye, and at what distance it is from the *Picture*. Which shall be the subject of the next Head.

III. Of

80 *A Treatise of Perspective.*

III.

Of the Situation of the Eye, or of the Point of Sight.

The Situation of the Eye, in regard of the *Picture*, would seem to be left to our choice because the Rules that are given for *Perspective*, are for all the different situations of the Eye. There is nevertheless a Rule, which is, to place it where naturally it ought to be to comprehend the whole Object that can be seen through a Window, for as such we now consider the *Picture*. Sometimes it is placed in the Center; so generally speaking, the principal point, that is to say, the point on which the principal Ray falls directly, ought to be in the middle of the *Picture*. But as we discover different Objects, according as we present our selves at a Window; that in looking sideways we discover what we did not see when we look'd straight forward, so we must place our Eye differently, according to the different situations of the parts we would see. *For instance*, being placed opposite to the Gate of a Church, I discover its front; but if I would see the sides or wings of this Church, I must change my station. So in representing the sides or wings of this Church, the point of sight ought not to be in the middle

A Treatise of Perspective. 81

middle of the *Picture*, it may be sometimes without the *Picture*; for it may happen, that to see the sides and wings of a Church, whose Gate is exactly opposite to the Window from whence it is seen, we may be obliged to take a station sidewise, so as the principal Ray shall be without the overture of the Window and fall aside. This is not ordinary; it is most natural to be placed opposite to the Center of the *Picture*, where by consequence the principal point should be. It is on this Center we look: What is directly opposite to the Eyes, is most sensible, and is best seen. So it is at the principal point, or near it, that the best Painters place the chief Person of the History they represent; and who ought to attract the Eyes of the Spectators most.

The natural height of the point of sight, is the natural height of the Eye. We ought then to suppose the point of sight, and consequently the principal point, which are both on a level, to be at the ordinary height of our Eye. But as there are Objects which cannot be seen, but from low to high, or from high to low, that we cannot see the Wainscot of a Ceiling if the Eye be not below, nor the inside of a Court surrounded with Buildings, if the Eye be not elevated higher than these Buildings; so there are Pictures, in which the principal point is above,
G and

82 *A Treatise of Perspective.*

and there are others, in which it is below the *Picture*.

When we would see a great Edifice, we take our station in the front, to the right, to the left, on the ground, or in eminent places, according as the Edifice is situated, and according to the parts we would discover. Such Perspectives, whose point of sight is placed in such manner, as that we suppose the Spectator elevated in the Air, as if he were a Bird, are called, *Perspectives at a Birds sight*.

But the Eye without being raised above the Earth, can see things that are more elevated, and see them directly; for we may turn our head backward without incommoding us. Besides the Eyes can turn themselves upwards, so as the sight of things much above their natural height, shall smite them in a direct line. This happens in *Pictures* which are placed above the Eye. But as we can see nothing through a Window which is above the Eye, but what is in that Window; and that we cannot perceive what is beyond it, unless it be in the Air, higher than the overture of the Window; so in a *Picture* representing that Window, all ought to be forwards; and we ought to make the head appear, or the highest parts of what we conceive beyond that Window.

Pictures

A Treatise of Perspective. 83

Pictures that are placed in high places, are often made to incline, so as we must raise our Heads, and turn our Eyes upwards, to see them, to the end the principal Ray may be perpendicular to the *Picture*. In this case the principal point may be in the *Picture*, tho' it be placed above the Eye; but this is not natural, for the Persons appear in a situation where they cannot be. A body inclining must fall, if it be not supported; so if the *Picture* be truly inclin'd, it must represent the Figures with so much Art, that they appear upright or standing. We shall speak of this Art in the seventh Chapter. Ordinary Pictures ought to be upright; if they be inclined, it is because the Dust may stick less to them.

We have already said, that in a *Picture*, whatever is above the principal point, is seen lower; and that what is placed lower, is seen higher, and seems to mount; whereas what is placed above this point seems to descend. 'Tis evident that the Circumferences of Figures alter as they draw nearer, or remove farther from that point. Some should be seen in front, when they are at the principal point, and directly opposite to the point of sight; others are seen only in *Profile*; and such a Figure as being placed on the left, shews the Stomack, in another situation would present

84 *A Treatise of Perspective.*

the Shoulders; this is the reason that those who in their Designs make use of Figures borrowed and copied from the Draughts of diverse Masters, or from their own proper Studies in the Academy, ought to be careful to place them as they should be, in relation to the point of sight, under which they were first designed.

We have already said, that a Figure, whatever it be, being once set on a Plan, can never have the same appearance in any other place of that Plan, to which it may be transported, if the point of sight continue fixed. So that without the help of *Perspective*, it is not easie for those who steal any part of the Works of another Painter, to place it as it ought to be in a new Composition; as is observed by Rowland Freard of Chantelon of Cambray, in that excellent Idea he hath given of the Perfection of Painting.

It remains now to speak of the just distance that is to be given to the point of sight; this depends on the largeness of the *Picture*: What is large cannot be seen at once, if it be not at a distance; so that it is the size of what we would represent, that regulates this distance. When the Eye is too near, the Plan on which the Figures are placed, appears elevated in *Talus*, and the Diminution of the Figures is too sudden; without a proportion to those that

are

A Treatise of Perspective. 85

are on the forepart of the *Picture*. On the contrary, if the point of sight be more remote than it ought, the things are confused and huddled together. This point ought therefore to be at a moderate distance, which will be easier found by Experience, than by Arguments; for before any thing be concluded on, we see very near what effect the things will have, according as the point of sight is at a distance, or near.

What we would have appear distinctly, ought to be seen very near, for what is seen at a great distance, we perceive confusedly. Wherefore when we would represent distinctly any Object, the distance of the Eye ought not to be great. As we cannot discover a great Building at a single view, unless we retire to a great distance, so the Perspective of a large Building is never very distinct. Likewise if we would have our Designs clear, we must represent in particular every one of its parts, and make different Designs. In a word, to regulate the distance of the Eye, it must be such as to comprehend every thing entire without trouble; and to see and distinguish plainly all the small strokes. We should not here have regard to such as have bad Eyes, because the Musician does not sing to the Deaf.

86 *A Treatise of Perspective.*

IV.

Establishing the Necessity of Perspective, and answering the Difficulties which are framed against this Necessity.

Before we begin the next Chapter, which contains the practical part of Perspective, let us consider what several of the most indifferent or lazy Painters are used to object; that if we should confine our selves to the rigorous Rules of *Perspective*, there are some cases, in which, instead of Figures well proportioned, we should represent them monstrous, as happens in Representations of *Architecture*, when we follow the Rules of *Perspective*. They cannot shun (say they) meeting with some things extremely troublesome, such as the excessive lengthening of the Cornishes, of the Capitals, and of the Bases, their sudden fall, and their disorder; which happens when any one would put them in Perspective according to the Rules of Art; for as we have demonstrated, the Perspectives of lines perpendicular to the Picture tending all to the same point, which is the principal point; if it be Columns that are to be put in Perspective, and if the point of sight be elevated, the Bases of the Columns which ought to be Horizontal, must nevertheless mount excessively; and on the contrary,

if

A Treatise of Perspective. 87

if the point of sight be placed low, the Capitals seem to overturn, and fall toward the place where the point of view is.

To this I answer first, If the business of Painting were only to represent things to the Life, it would be no fault if they appeared maimed and deformed, if they must effectively appear so, in the Situation they are supposed to have, and in which they are painted. But as Painting is only made use of to please, so nothing ought to be painted but in a state where the Eye is satisfied. Thus Painters correct Nature it self, or chuse only what is the finest and biggest; to this end they never chuse a Situation, which, by following the Rules, will infallibly make their Pictures maim'd and monstrous; that is to say, if they must appear so from the point from whence they ought to be seen. They place therefore their point of sight, according to the posture they would have their Work appear in; and if they mix any *Architecture* with it, they order it so, as nothing appears offensive.

Secondly, If there is any thing disagreeable in such Perspectives as are made according to the rigour of the Rules, it is occasioned by want of Art: The *Mathematicks* alone suffice not to make a good Perspective, they only shew us how to find certain Points, and to draw necessary Lines, but this is not enough; the

88 *A Treatise of Perspective.*

principal thing is, the Light and Shadows, 'tis the Colours that makes us judge of the distance of things, and of their Disposition and Situation. So (*for instance*) whereas in the Draught of the Base of a Column, all its parts, tho' Horizontal, seem to elevate and mount, *Painting* can preserve its natural appearance, in representing the parts most distant from the Eye as fading, and as they would appear if they were seen really without the *Picture*: In which case they seem to mount and elevate on the Horizon. It is the same with these Postures we call maimed, which never appear but either too lively, or not faint enough. The weakening and diminution of Colours, make the principal Performances of *Painting*.

For the farther defence of this Art, which we treat of as Mathematicians, let us add, that *Pictures* or *Perspectives* cannot have the desired Effect, but when they are seen from a certain point. But we place them very seldom in this point, in order to be examined; neither is it possible to do it, when the *Pictures* are small, and their Figures not of a natural bigness. The Basis of the *Picture* ought to be the ground line; that is to say, common to the *Picture*, and the Plan on which we suppose the Spectator, and the Persons represented in the *Picture*; but this is never done. For these *Pictures* are placed on a Table much higher than the Plan

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A Treatise of Perspective. 89

we stand on to consider them ; and as they have some fine strokes, and some small parts, which cannot be seen but near, so we cannot see them at a necessary distance ; nevertheless because they have not their natural bigness, they ought not to be seen but at a great distance. So if any thing in Perspective appear deformed, that Deformity happens, because the Rules of Art are not observed ; for in Perspectives, where the Bases of Columns are seen to mount excessively, and the Capitals to overturn, the Point of Sight is too near ; if it were at a good distance, the Perspectives of the Bases and Columns would be so small, that the great difference betwixt the advanced part, and the remote part of the same Column, would not be observable. When we represent *Architecture*, or would shew a great Front with very high Columns, we are obliged to take our point of Sight at a considerable distance ; for it is impossible for us to see a very lofty Building, and of a great extent, at one view, if we do not stand at a considerable distance. Therefore the supposing the Point of Sight too near, for discovering at one view what we represent, is a fault which ought not to be imputed to the Art.

It may be answered, That we are sometimes obliged to it, especially when we would shew the smallest parts of a piece of *Architecture*;

90 *A Treatise of Perspective.*

ecture; that in that case the Eye must be near, because distance renders every thing confused. I answer, That this Constraint is but Imaginary, and that we ought not to desire any thing but what is reasonable; that if we suppose a considerable distance, the small parts ought not to appear distinctly; and if the Edifice we represent, is very high, and near the *Picture*, we must shew only the foot of it, because we could see no more, if we saw it effectually through the overture of the *Picture*, supposing it to be transparent or open. Architects, in the Designs they make of great Works, use *Perspective* only for the general view of an entire Edifice. They make only Geometrical Representations of the parts. For, once more, we cannot see an intire Building of a great height, and large extent, at one view.

I do not deny but there are many fine *Pictures*, in which *Perspective* is not observed; it is not observed in small *Pictures*, as I have said. This Confession does not destroy what I have established, that *Perspective* is the Foundation of *Painting*, and that a *Picture* cannot have the same effect as the things themselves, if all the Rules be not observed. We must consider the small *Pictures* but as Imitations, whereas a true *Picture* is a Representation, which makes the same Impression on the Eyes, as the thing represented would
do,

A Treatise of Perspective. 91

do, if it were seen ; which ought to appear in the *Picture* in its natural bigness, according to the shape it hath, and all the measures of that shape. To make an Imitation perfect, what is done in small, ought in that smallness to have the same Proportions. Consequently a small *Picture*, which is a Reduction, that is to say, which is reduced from great to small, tho' it be not seen from the point from whence it ought absolutely to be seen, *i. e.* from the true point of Sight ; it ought to have a point to which all bears ; so that if this *Picture* were reduced from small to great, all the Figures would appear in their natural Size, and the point of Sight would be, that where the Eye being placed, the Sight of this *Picture* would make the same Impressions on it, as the things themselves would do if they were present.

'Tis the Imitation which pleases, and which we admire in *Painting* as well as in *Poesy*. A Poet represents upon a Theatre in a short space of time and place, an Action, which (so speaking) hath taken up a great deal of ground, and a considerable time. He is careful of the Likelihood, and all he says, may be done in the manner he says it, and in the place and time of the Representation. It ought to be the same with *Painting*. A *Picture* is the Representation of an action, which we suppose
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92 *A Treatise of Perspective.*

to be acted in the presence of him who considers the *Picture*. He ought to see nothing that belyes this Representation; it is not so much the Features and Colours that appear admirable, as the perfect Imitation which subsists always, whether the *Picture* be of a natural Size or not; as we take pleasure in reading a Comedy, which can be read in less than an hour. Every *Picture* is an Imitation, but a small *Picture* is the Imitation of an Imitation. A small *Picture* cannot make the same impression on the Senses, but it may upon the Mind, which is charm'd with the Ingenuity of a Painter, that can ingeniously imitate in small, what may be done in great. Now this Imitation would be imperfect, and this little *Picture* would not satisfy the Mind, if *Perspective* were not observed in it. For as we have often said, we can only paint the instant of an action seen from a certain point; in respect of which, the Actors have a certain determin'd Circumference. Therefore Likelihood is not observed in a *Picture* great or small, if all be not ordered with relation to a certain point; tho' that be not the same in a small *Picture*, where the Eye that considers it might be placed; but the Soul finds this point, and it is with relation to this point that it judges of the *Picture*. We may likewise say, that in a small *Picture* all is intirely reduced from great
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A Treatise of Perspective. 93

to small, and the Spectator himself becomes so small, that his height doth not exceed that of the principal point above the base of the *Picture*. 'Tis the Ingenuity of him that imitates, which pleases; what we see is not real, and Falsehood cannot be agreeable; therefore 'tis the Likelihood, or the art of representing Truth, which renders *Painting* so Charming; and *Painting* doth not please, but so far as it favours of this Art. We should take no pleasure in seeing a *Picture*, in which every thing were represented in its natural bigness; that is to say, if it were a perfect *Perspective* made according to all the Rules; and if we were so deceived, as not to perceive our Error, or not to be sensible of its being only an Ingenious Imitation.

Instead of considering small *Pictures* as a Reduction of greater, we may consider them as the things themselves reduced. 'Tis so we ought to consider the designs of *Architecture*, which are contained on a leaf of Paper: We may suppose the Designer did not intend to represent the Edifice such as it is; but that it is reduced to smaller, that he hath made a Model of it, and that 'tis only this Model he designed to represent.

Having proved *Perspective* to be the Foundation of *Painting*, before I come to the Practice of the Art I teach here, I will first re-
move

94 *A Treatise of Perspective.*

move a thought which some may entertain, as if I pretended that my Work were sufficient to make an excellent Painter; and thereby undertake to teach what I do not know. I repeat once more, that the Science I explain, supposes a perfect knowledge of the design. By that word is understood the just Measures, the Proportions, and the external form that the Objects ought to have, which we represent in Imitation after Nature; and that with relation to the point of Sight. For according as an arm (*for instance*) is seen, so it appears to have a certain measure. 'Tis not its real measure which must be represented, but the measure it assumes by being seen from a certain point; this is what the Painters learn, who make their Exercises in Academies, designing after *Relief-work*, or from a living Model. There are Books which explain the Proportions of a Humane Body, and discover which are the finest, for Painters should not express but what is rare and fine. For my part, I only treat of *Perspective* as a Mathematician, tho' at the same time I alledge, that it is the Foundation of *Painting*.

CHAP.

CHAP. VI.

*How to find the Perspective of
any Object whatever, its Situ-
ation being given in regard to
the Picture and the Eye.*

THE Practical part of the Art of which we treat, consists in finding the *Perspective* of a given point in the Geometrical Plan, or elevated above that Plan, whose Situation is known, in regard to the *Picture*, and the *Eye* that is to see it. For all visible Objects whatever, are but a heap of Points; and these Points may be innumerable. It may then be ask'd, Whether it be not an infinite labour to search for them all? But the thing is not so difficult as it at first appears. To comprehend this, observe *First*, That a Line is known when its Extremities are known: So that to find the *Perspective* of a Line, we must search for the *Perspective* of its two Extremities; for as we have already demonstrated, the *Perspective* of a Line is a Line.

Secondly, Since to draw a Parallel to a given line, 'tis sufficient to know one single point through which it must pass; so to find the

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96 *A Treatise of Perspective.*

Perspective of a line parallel to the *Picture*, we need only search for the *Perspective* of one point of that parallel; for we have already demonstrated, that the *Perspective* of a line, which is in the Geometrical Plan, and is parallel to the base of the *Picture*, will in the *Picture* be parallel to the same base.

Thirdly, Having the *Perspective* of one point of a perpendicular on the Geometrical Plan, we have the *Perspective* of the whole perpendicular; this *Perspective*, as hath been proved, being perpendicular on the base of the *Picture*; and the Position of a perpendicular depending only upon a single point.

Fourthly, Since the *Perspectives* of Figures parallel to the *Picture*, are similar to these Figures, the *Perspective* of one of their sides being found, it serves as a common Measure, or Scale of Reduction, with which it is easy to finish the same Figure in the *Picture*.

Fifthly, The *Perspective* of a line in the Geometrical Plan being known, to find one parallel to it, 'tis sufficient to know one of its points; for if these parallel lines be perpendicular to the *Picture*, then their *Perspectives* being prolong'd, pass through the principal point: If they be not perpendicular to the *Picture*, their *Perspectives* being continued, cut the Horizontal Line in the same point, which is called the *Accidental point*.

A Treatise of Perspective. 97

So there needs no extraordinary pains to find the Perspectives of all the points of an Object, because the knowing of a few gives the rest. In the following Problems, we must suppose these things known, to wit, the Situation of the *Picture* in regard of the Eye, and consequently the point of Sight, or principal point, the distance of the Eye from that point, the remoteness of the Object behind the *Picture*, and all that concerns its Situation, in regard to the *Picture*.

PROBLEM I.

To find the Perspective of a point which is in the Vertical Line of the Geometrical Plan.

B D is the Vertical Line, A the Eye, and E the Object, whereof C is the Perspective. The distance between the Object and the *Picture* is D E; the Line A B or H D is the distance of the eye from the *Picture*; these distances are known. A H the height of the eye is likewise known; so is the Triangle A H E; raising then upon the point D a perpendicular, terminating at the line A E, the point C Perspective of E is found. *Which was to be done (Plate 15. Fig. 1.)*

This is easily done, by transporting the distance of the eye A B, on the Horizontal
H Line.

98 *A Treatise of Perspective.*

Line. Take BF equal to AB , and on the ground line mark the distance of the Object E , by taking DG equal to DE ; then draw a right line from the point G to the point F , (*these are the points which in the second Chapter we have called the points of distance*) which line FG cuts the Vertical line BD at the point C Perspective of E . This is evident; for the triangle FKG is equal to the Triangle AHE , and the Triangle DCG is equal to DCE ; so $HD, DC :: KD, DC$.

Therefore the point C may be found by Calculation; and as all the following Problems are reduced to this, when the Situation of the Objects, in relation to the *Picture*, and to the point of Sight, is known, it will be easy to make a Table of Numbers, which shall give the measures of a whole Perspective.

LEMMA I.

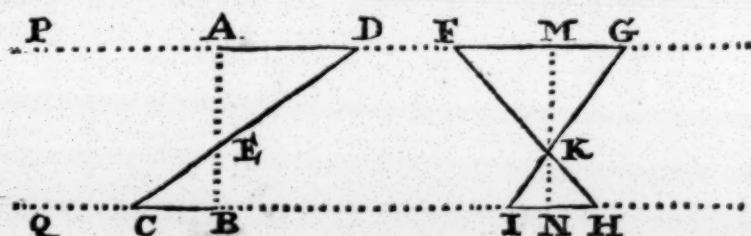
Let P and Q be two parallels, between which AB and MN are perpendiculars. $AD=FG$ and $BC=IH$; I say, that DC cuts AB at the same height that GI cuts the perpendicular MN , drawn through the point K , the Section of FH by GI , and that $BE=NK$ and $AE=MK$.

DE.

A Treatise of Perspective. 99

DEMONSTRATION.

The Triangles AED and $BE C$ are similar, and so are FKG and IKH ;



So $BC, AD :: BE, AE$,
and as $I H, F G :: N K, M K$,
now $BC = I H$ and $AD = F G$;
therefore $BE, AE :: N K, M K$.

Et Componendo.

$BE + AE$ (or AB) $AE :: NK + MK$
(or MN) MK .

So $AB, AE :: MN, MK$,
and $AB, MN :: AE, MK$.

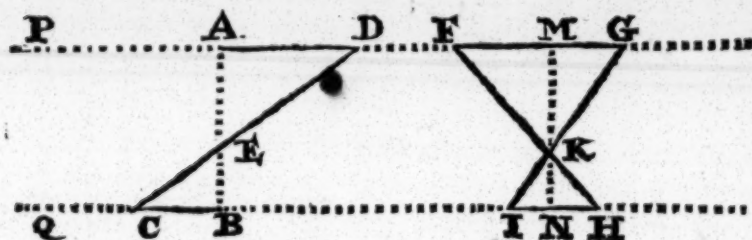
Now these two perpendiculars AB and MN are equal, being between the same parallels; therefore the lines AE and MK are likewise equal, and consequently BE is equal to NK ; which was to be demonstrated.

100 *A Treatise of Perspective.*

LEMMA II.

Dividing the distances FG and IH according to the same proportion, a line drawn through the points of this division, will cut FH and GI at the same height as BE.

Whereas we have supposed AD equal to FG, and BC equal to HI; suppose now AD is not equal to FG, nor BC to HI; but only that there is the same proportion



between these two lines; that is to say, $BC, AD :: IH, FG$, in that case the same will happen as in the former Lemma; that is to say, AB and MN will be cut at the same height.

DEMONSTRATION.

Because the Triangles AED and BEC are similar; as likewise FKG and IKH; therefore $BC, AD :: BE, AE$, and $IH, FG :: NK, MK$; fo the reason of
BC

A Treatise of Perspective. 101

BC to AD, is the same as that of IH to FG; therefore two reasons being equal to a third, they are all equal.

$$BE, AE :: NK, MK.$$

Consequently Componendo.

$$BE + AE \text{ (or } AB) : AE :: NK + MK \text{ (or } MN) : MK. \text{ So } AB, AE :: MN, MK.$$

Then Permutando.

$$AB, MN :: AE, MK.$$

Now $AB = MN$; therefore $AE = MK$, then $AB - AE = MN - MK$. But $AB - AE = BE$, and $MN - MK = NK$. Therefore $BE = NK$. Which was, &c.

PROB. II.

To find the Perspective of a point, in any place whatsoever of the Geometrical Plan.

Suppose Y a point given in the Geometrical Plan, and its Situation known. Its Incidence on CD the base of the Picture X, is B, the point of sight is A; the line AO is the Section of the Vertical Plan. The distance of Y from the Picture, is equal to BE, which I mark on the ground line, prolong'd at discretion. The distance of the Eye is equal to AF, which I have also marked on the Hori-

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zontal

102 *A Treatise of Perspective.*

zontal Line G H, prolong'd as far as requisite: So E and F are the points of distance, through which I draw the line E F, which cuts A B in a point, which is the Perspective of Y; which was to be demonstrated, (Plate 15. Fig. 2.)

First, The Perspective of Y, ought to be in the line B A, Chap. 4. Theor. 4.

Secondly, If the point Y were in the Vertical line O P, then A B would be a perpendicular.

Thirdly, Let Y be elsewhere than in the Vertical line. By the Theor. 19. Chap. 4. its Perspective is in a parallel to the base of the Picture, to wit, in the Perspective of Y P, which is parallel to the same base: Therefore whither Y be in the Vertical line or not, its Perspective is in the same parallel, and consequently at the same height. Now the distance of the Eye, and the distance of Y, is in this case the same, consequently according to the first preceding Lemma, F E cuts A B, whither A B be a perpendicular or an oblique line: Therefore the Perspective of Y, which is in A B, and in F E, will necessarily be in the Section of those two lines.

ADVER.

Fig. 1.

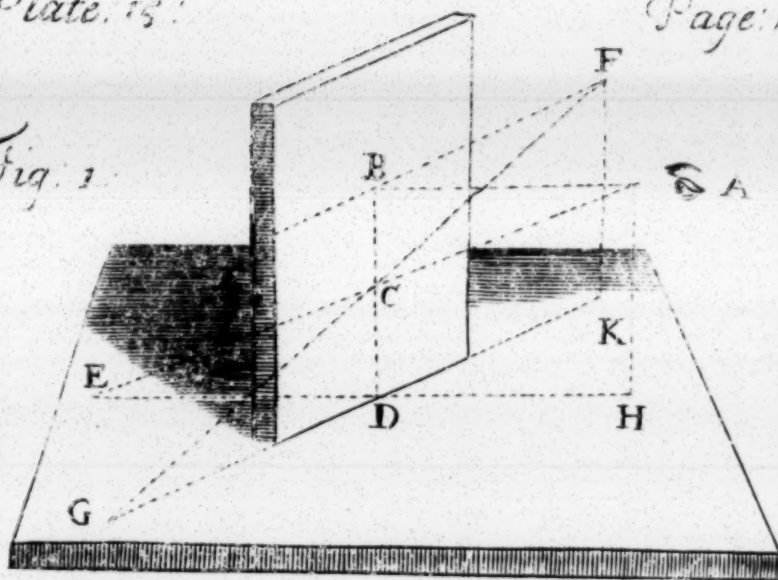
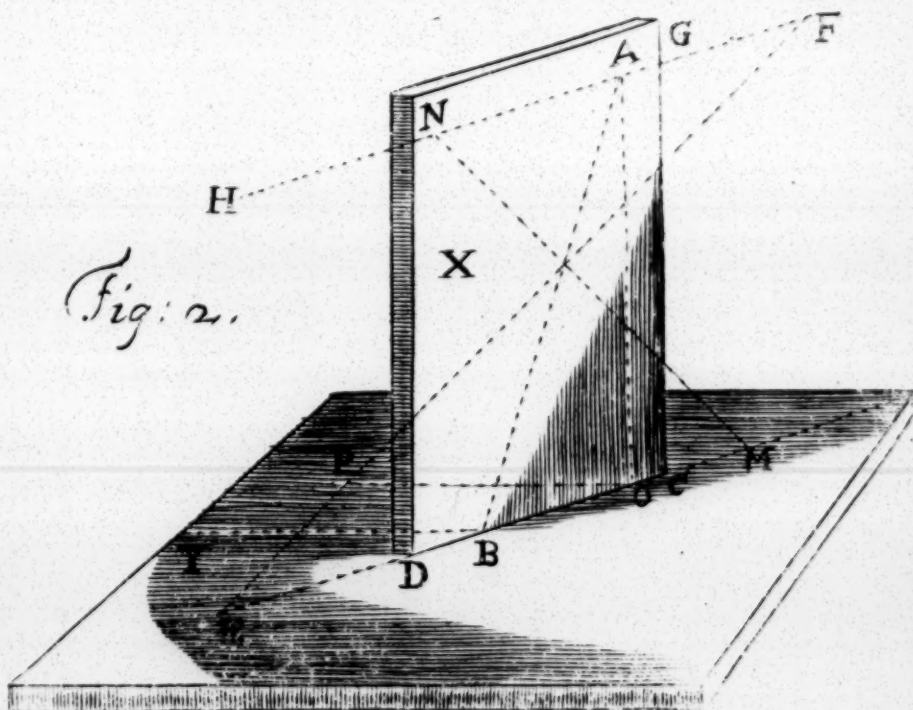


Fig. 2.





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First, The point of *Incidence* B being known, there is no occasion for drawing the line A B; for having marked A N equal to A F, and B M equal to B E, the Perspective of Y is in F E and in M N, and consequently in their Section.

Secondly, If the *Picture* be too narrow, and it be difficult to prolong the ground line, and the Horizontal line (which may be done nevertheless by applying long Rulers) we need only to diminish proportionably the distance of the eye, and of the visible point; taking only a third or a fourth of one and the other distance; for then, according to the second Lemma, the line A B shall be cut in the same point by F E.

Thirdly, To facilitate the Operations, they tye a small string to the point of sight, which changes not; and moving it to the points of *Incidence* of all the points whose Perspective is sought, this string represents A B. They tye likewise a string to the distance of the eye which is always in the same point, and moving it to the points of distance of the visible object, the place where it cuts the first string, is the Perspective look'd for. Instead of a string, a Ruler may be applied to the

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point

104 *A Treatise of Perspective.*

point of *Sight*, and point of *Distance*, and the effect will be the same.

PROB. III.

To find the Perspective of a line which is in the Geometrical Plan.

I find by the preceding Problem, the Perspectives of the two Extremities; between which I draw a line, which is the Perspective of the line proposed; and this Perspective is a line, according to what hath been demonstrated, *Chap. 4. Theor. 2.*

PROB. IV.

To find the Perspective of a line which falls perpendicularly on the Picture.

Find as in the foregoing Problem, the two points, which are the two Extremities of the line proposed, and draw a right line betwixt them; this will be the Perspective sought for. If it were not necessary to determine its greatness, it would be sufficient to find the Perspective of one of its points; for the line which contains its whole Perspective, must pass through the principal point, if prolong'd, as hath been demonstrated, *Chap. 4. Theor. 4.*

PROB.

A Treatise of Perspective. 105

PROB. V.

To find the Perspective of several Lines parallel amongst themselves, but not to the Picture.

CASE I.

These Lines which are parallel amongst themselves, may fall perpendicularly on the *Picture*; and in this case their Perspectives are found by the preceding Problem.

CASE II.

If these Lines parallel amongst themselves, are not perpendicular to the *Picture*, the Perspective of one of them must be found by the third preceding Problem, which being prolong'd to the Horizontal line, which it will cut, as hath been proved by *Chap. 4. Theor. 5.* it gives the *Accidental* point, in which all the Perspectives of these parallel Lines do meet, because they all cut the Horizontal line in the same point by *Chap. 4. Theor. 6.* So it suffices to find the Perspective of one single point of these lines, for that gives the Perspective of every one of them. But to determine the length of these Perspectives, the Perspective of the Extremities of each of these lines must be found, if it be not found already.

PROB.

P R O B. VI.

To find the Perspective of several lines parallel to the Picture.

Since the Perspective of these lines is parallel to the base of the *Picture*, Chap. 4. Theor. 3. then by finding the Perspective of one of their points, you have that of the lines. For to draw a line parallel to a right line given, it's enough to have a point through which it passes, as is shewn in the *Elements of Geometry*.

P R O B. VII.

To find the Perspective of the Division of a Line

Let *CD* be a line divided into three parts (see *Plate 16, Fig. 1.*) *CH*, *HG*, and *GD*; the ground line is *ME*, the principal point *A*, the point of distance of the eye is *B*, the points of Incidence of *C*, *H*, *G*, *D* are *L*, *I*, *F*, *E*. I first enquire after the Perspectives of the Extremities *C* and *D*, taking *LM* equal to *LC*, and drawing from *M* to the point *B* the line *MB*, which cuts the radial *AL* in *N*; which is the Perspective of *C*. I take likewise *EK* equal to *DE*, and draw from *K* to *B* a right line which cuts *AE* in *O*;

tha which

A Treatise of Perspective. 107

that O is the Perspective of D; consequently NO is the Perspective of CD. Now having drawn *radial* lines from the points of Incidence E, I, F, E of the parts of CD, to the principal point A, these *Radials* shall give the division of NO; for the Perspectives of the points H and G are in the line NO; and likewise in the *Radials* AI, AF, and consequently in the points *p* and *q* common to NO, and to these *Radials*.

If we were in quest of the divisions of a line perpendicular to the *Picture*, as if LC were divided into three parts, then LM must be divided into three equal parts, and a line drawn from each point to the point B, which will give the division required, for the line LN is the Perspective of CL, which will be cut by those lines in the points desired.

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Tho' the principal point be unknown, yet the points of distance may be known, as in this other Figure where D and F are the points of distance. The point of which K is the Perspective, is distant from the *Picture* the length of the line AE, (see *Plate 16. Fig. 2.*) and the point H is the Perspective of A, which by this is on the base of the *Picture*.

To

108 *A Treatise of Perspective.*

To have the eight Divisions of A K, divide A E in eight equal parts, and from each of these parts draw a line to F, which gives the divisions required; for these lines, as well as the *Radials*, ought to cut A K in the points which are the Perspectives of these points, the distance of which is mark'd by the divisions of A E. The same must be done to find the divisions of A I, dividing A C in eight equal parts; and from each of those parts drawing right lines to the point D.

PROB. VIII.

To find the Perspective of a Parallelogram divided in several Parallelograms, on the Geometrical Plan.

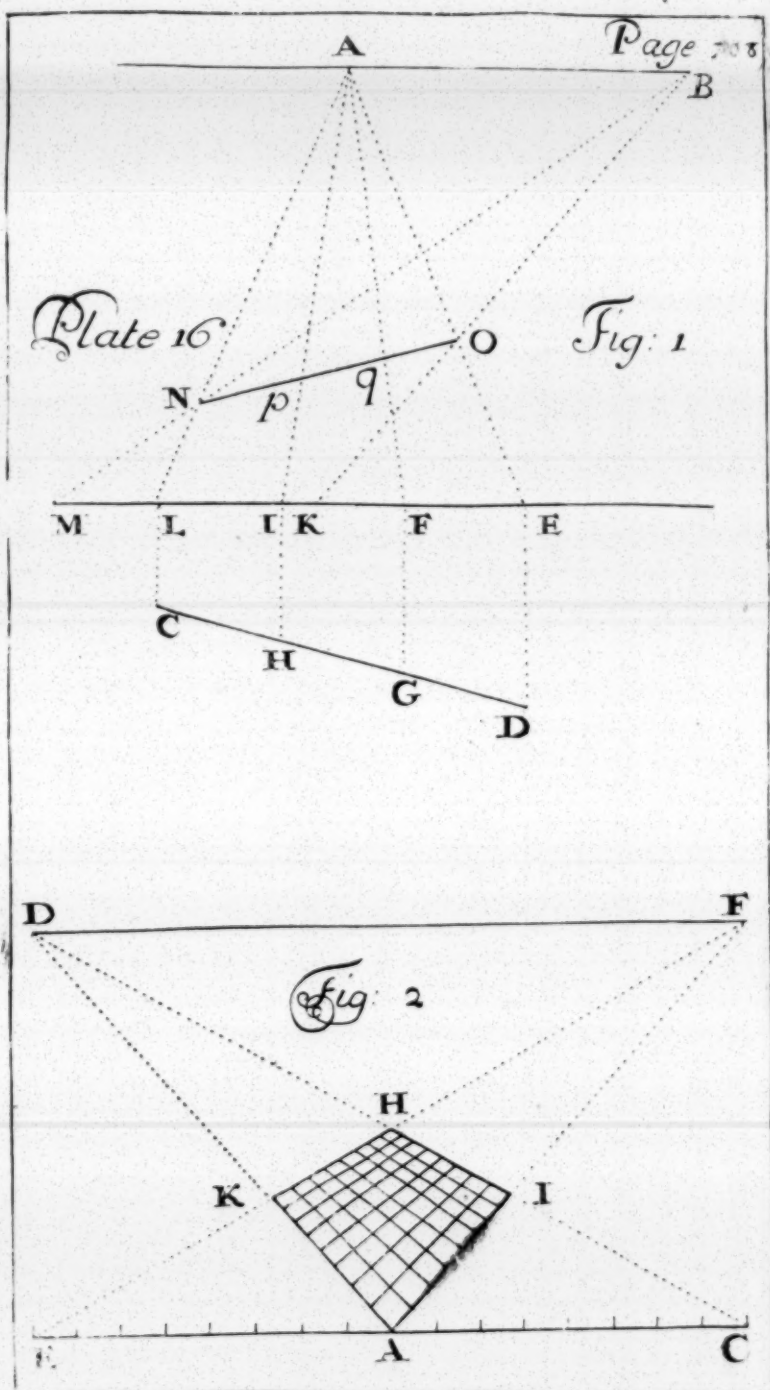
This Problem is easily resolved by the preceding Problems, and thus abridged. Let the Parallelogram B C D E be proposed, and divided in several other small Parallelograms (see *Plate 17. Fig. 1.*) I suppose it on a Geometrical Plan behind the *Picture*. It may be so placed, that all its lines shall be some of them parallel, and some of them perpendicular to the *Picture*, or else they shall all be oblique. This makes two Cases.

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A Treatise of Perspective. 109

CASE I.

Let $BCDE$ be a Parallelogram. I suppose BC on the ground line or base of the *Picture*: The principal point A , to which I draw lines from each part of the division of BC ; I apply the Ruler to the points H and L which I have found, and to the *Accidental* point N , and draw betwixt HL and IK right lines: I do the same on the divisions of KL , with relation to the *Accidental* point M , which gives me the figure H, I, K, L , Perspective of A, B, C, D , and of all the Parallelograms which it incloses.

CASE II.

Suppose $ABCD$ a Parallelogram containing several others; the principal point is E , the points of distance are F and G ; I search *first* by the common Rules the Perspective of the four points A, B, C, D , which I find to be H, I, K, L .

Secondly, I apply the Ruler to HI , or on LK , and marks the point N , which shall be one of the *Accidental* points, where all the Perspective lines of the parallels to AD and to BC shall terminate. I apply likewise the Ruler to HL or IK , and I find the *Accidental* point M .

Thirdly,

110 *A Treatise of Perspective.*

Thirdly, I search by the foregoing Problem, the Perspective of the divisions of A D and of D C: I apply the Ruler to the points of H and L which I have found, and to the *Accidental* point N, and draws straight lines between H L and I K: I do the same on the divisions of K L, with relation to the *Accidental* point M, which gives me the figure H I K L, Perspective of A B C D, and of all the Parallelograms which it incloses *which was to be done.*

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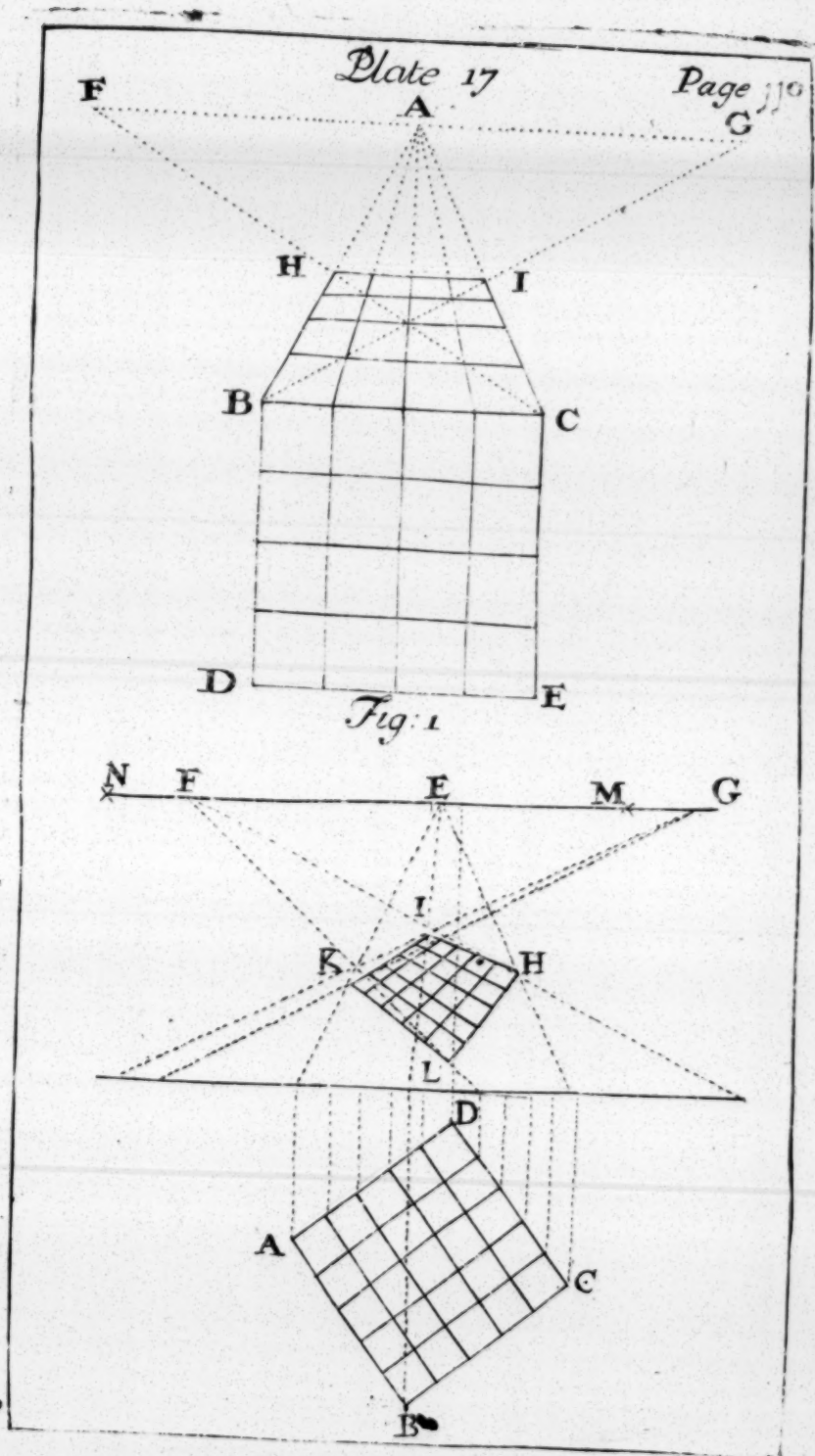
This Practice is of importance, for by it we perform, what, without its assistance would be very difficult. In the first place it gives Painters the *Degradation* of a *Picture*: They imagine the Geometrical Plan to be a Parallelogram comprehending several lesser Parallelograms. Then they trace first the Perspective of all these Parallelograms, which is easily found by the preceding Operation. After which, as I have already observed, they have the *Degradation* of the *Picture*; and know what Diminution to give their Figures.

This Practice furnishes a short way of copying all sorts of Figures, and putting them in Perspective. To copy a Figure, inclose it in a square Frame, divided in several smaller

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A Treatise of Perspective. 111

smaller Squares. Then if the Copy be desired of the same bigness as the Original, make another Square equal to the former, or greater or smaller in proportion to what you desire your Copy to be; after that carry what is contained in each Square of the Original, into the Square that answers it in the Copy. This is easily comprehended. If the Square intended for the Copy, is equal to that which incloses the Original, the Figure that is copied, will be precisely alike, and equal to the Original. If it be only a third part, the Copy will be still like, but three times less. Now 'tis easy to put this Figure in Perspective, whether it be an Original or a Copy, as the following Problem will demonstrate.

PROB. IX.

To put any Plan or Figure whatever in Perspective.

The Figure must be put in a Frame, or Parallelogram, divided into lesser Parallelograms, as was said in the beginning: Then the Perspective of that Parallelogram must be found by the former Problem; and the Figure in it, placed in the Perspective of each of the small Parallelograms. As for example, it is desired to put the Plan of the Cittadel X
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112 *A Treatise of Perspective*

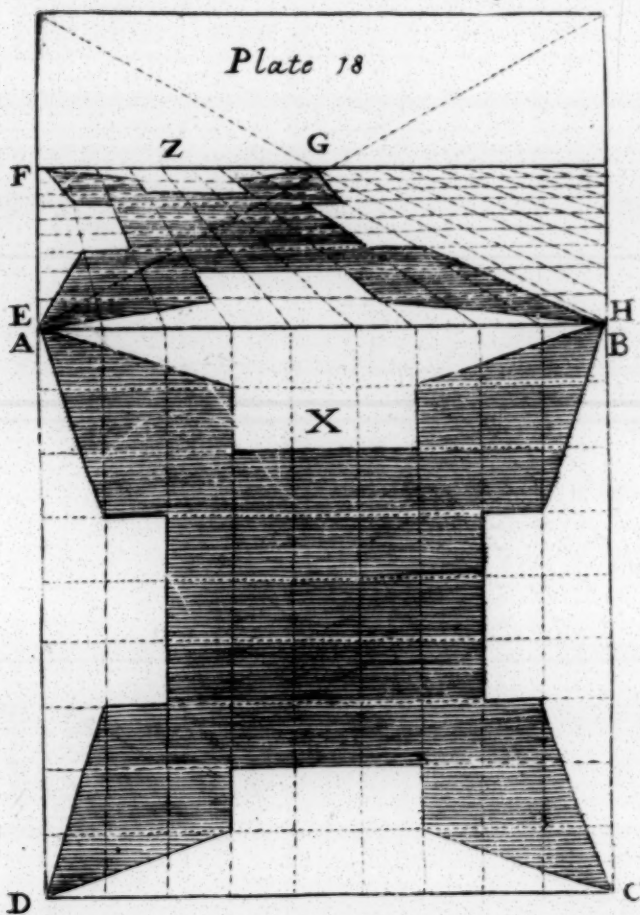
in Perspective, see *Plate 18*. Make the Square *A B C D*, which comprehends several smaller Squares, these Squares contain the parts of the Plan of this Cittadel. Then find *E F G H* Perspective of the Square *A B C D*, and of all its parts. This done, transport into the parts of the Perspective Plan *Z*, all the parts of the Geometrical Plan *X*, that answer to it. This may be conceived easily by the Figure.

P R O B. X.

To put a Circle in Perspective.

Generally in putting any Plan Figure in Perspective, whither it consist of right or crooked lines, the Practice must be as we have said. So to find the Perspective of the Circle *X* (see *Plate 19. Fig. 1.*) after having inclosed it in the Square *B C D E*, and divided the Square as you see, search for *Z* Perspective of this Figure; which being found draw the crooked line *Z* through the points where the Perspectives of the right lines that cut the Circle *X* cut one another; and this *Z* is the Perspective of *X* which was desired.

Plate 18



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A Treatise of Perspective. 113

PROB. XI.

To find the Perspective of a point in the Air over the Geometrical Plan, such as Y.

First, Find its point of *Seat*, and the point of *Incidence* of this *Seat*: I suppose the point of *Seat* to be in the line KB , of which B is the point of *Incidence*, (see *Plate 19. Fig. 2.*) I erect on B the perpendicular BC of the height of Y . After which, having drawn a line from C to the point of sight A , I say the Perspective of Y must be in the line AC ; for having drawn a perpendicular from Y to the *Picture* X , its point of *Incidence* is C : now the Perspective of the line YC is in the line AC ; therefore the Perspective of Y is some point of the line AC , such as g .

Secondly, To find which point of AC is the Perspective of Y , find by the second Problem the Perspective of K the foot of YK ; I suppose it to be d ; then I erect on this point a perpendicular which shall cut AC , in g the Perspective of Y ; for it is in AC as we have seen, and that Perspective must be in dg according to *Chap. 4. Theor. 7.*

114 *A Treatise of Perspective.*

PROB. XII.

To find the Perspective of Y K a perpendicular on the Geometrical Plan.

This Problem is the same with the former; for to find the point Y, its Seat K must be found, and consequently the perpendicular Y K, of which $d g$ is the Perspective, (*same Fig.*)

PROB. XIII.

To find the Perspective of several perpendicular Lines.

The *Vertical* or perpendicular B C being found, it remains only to find the points of *Seat* of the perpendiculars given: I suppose the points to be H, L, K, their Perspectives are a, b, d ; from these points draw parallel lines between A B and A C, as hath been shewn, *Chap. 4. Theor. 10.* (*see Plate 19. Fig. 2.*)

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It is easy to find by Calculation all these perpendicular Perspectives, or the Perspective greatness of lines which are perpendicular on the Geometrical Plan; for in the Tri.
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Fig: 1

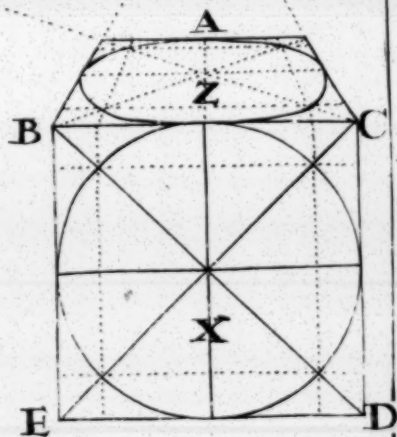
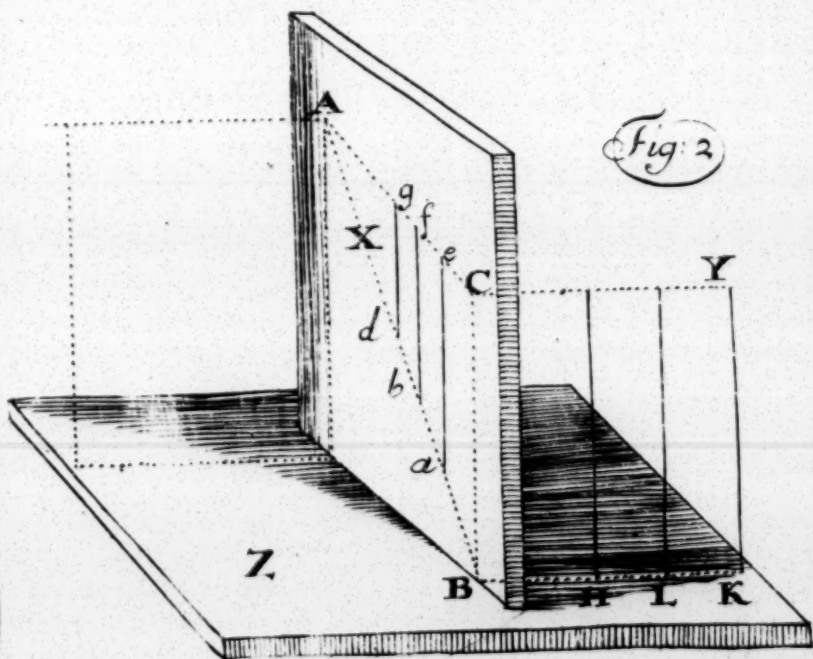


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A Treatise of Perspective. 115

angle ABC as BC , ae , bf , dg , are parallel, so they are proportional; so that knowing BC to be equal to YK , you have the length of ae for AB , $BC :: Aa$, ae , (*same Fig.*)

It is as easie to make a Scale for the Perspective as for the Geometrical Representations; which Scale gives all the Measures the parts of a *Picture* ought to have. Perspective Scales are called *Fleeing*, as we have said, because that whereas all parts of a Geometrical Scale are equal, those of Perspective decrease gradually. To have all their Divisions, make a common Scale in a Geometrical Plan; that is to say, divide into equal parts one of the lines of that Plan, which makes a right angle with the *Picture*, or is perpendicular on it: Then find the Perspective of that line and its divisions, and that Perspective will be the Scale desired; as if BK were a Geometrical Scale, the line BA , which is its Perspective, will be the *Fleeing Scale*.

We have seen that the Perspective lines of lines parallel to the *Picture* are divided in the same proportion as the lines of which they are Perspectives. A Scale in front, is the line which marks this proportion: 'Tis easy to find this proportion, and consequently the Scale is easily made.

116 *A Treatise of Perspective.*

This done, 'tis easy to make a Scheme of the whole Composition of a *Picture*: We may find by Calculation, as we have said before, the size of all the lines which measure the Objects that are to be represented, and consequently the measure of all its parts. They may be express'd by numbers, as an Architect does of a Building, of which he is forming the Design.

PROB. XIV.

To put in Perspective the Pilaster X and Z, parallel to the Picture.

Put first in Perspective, the Geometrical Plan of the bases of these *Pilasters*: So A being the Geometrical Plan of each base, their Perspectives (see *Plate 20.*) *abcd*, *efgh*, *inop*, must be found. The Operation is short, for according to *Chap. 4. Theor. 3.* all that is in the Geometrical Plan upon the same parallel with the *Picture*, ought to be in the same parallel in the *Picture*: Having thus found the Perspective of *abcd*, the other Perspectives of the bases are found, by drawing parallels to the base of the *Picture*, and lines to the principal point, as the Figure it self shews.

To

A Treatise of Perspective. 117

To finish the Perspective, we must raise perpendiculars on all those points which are the Perspectives of the points in the Geometrical Plan, on which are raised the sides of the *Pilasters*.

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Observe that all these Perspective bases are equal, that $abcd$ is equal to $efgh$, for the Triangles abc and efg being betwixt the same parallels, and on equal bases, to wit, ab and ef , are equal. It is the same with the Triangles acd and egb , which are likewise betwixt the same parallels, and on equal bases dc and gb ; for according to Chap. 4. Theor. 11. the Perspectives of the equal parts of a line parallel to the *Picture*, are equal.

The sides of these bases which are in the same line parallel to the *Picture*, as on , ef , ab , are equal; but the sides which are in the *Radials*, or in the lines which terminate at the principal point, are unequal; the line ni is longer than eb , and eb is longer than ad .

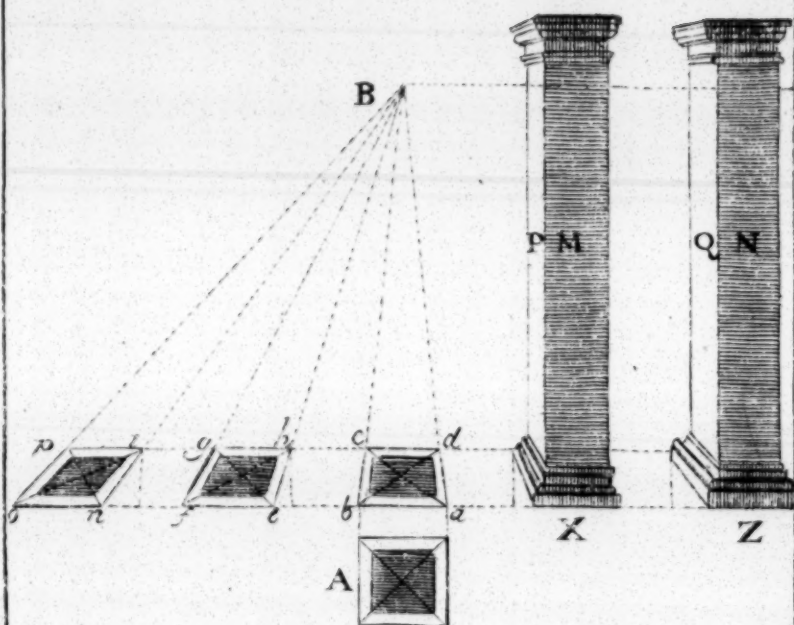
So that as a *Pilaster* is remote from the principal point, the side of its base augments, which is the reason that the face of the *Pilaster*, which is raised on that side, augments and

118 *A Treatise of Perspective.*

becomes larger, and infinite, if its distance were infinite. This is what makes a Perspective deformed, when a great number of *Pilasters* are represented on the same line parallel to the *Picture*; for the *Pilasters* which are at the extremity, should have their faces on those sides which are in the *Radials*; and much larger.

In the two *Pilasters* X and Z, (see *plate 20.*) the faces of the front M and N are equal; but the face Q of the *Pilaster* Z which is the remotest, is greater than the face P of the *Pilaster* X which is nearer the Eye. This inequality is offensive; but to avoid it, we should not put too great a number of *Pilasters* on the same line parallel to the *Picture*. It is likewise impossible that the Eye can discover at one view, an intire row of *Pilasters* all parallel, if it be not at a great distance; and then all these *Pilasters* are found to be very near the principal point; and become so confused, that their inequality is not seen.

All Pictures ought to be limited, as we have said before, because they ought to be seen at one view. It would be impossible to see those parts which are too remote from the principal point; for the Rayes that should come from thence to the Eye, could not enter it. Such as take right Methods, never make Pictures, or Perspectives, in which any
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A Treatise of Perspective. 119

thing shall appear monstrous or irregular. If the subject be vast, they suppose it at a great distance, and then all its parts come near enough to the principal point; and become so faint, that we are not sensible of the irregularity we speak of. Besides that, according to the Rules of *Painting*, as what is directly opposite to the **Eye** strikes it more lively, so we generally colour it more, and by consequence we darken what is remotest from the principal point. Now this darkening regulates the bigness, and is the reason why the irregularity is not so perceptible. When a long History is to be painted to adorn a Gallery, as *Poets* divide their matter in different Books, so *Painters* should distribute this History in different Pictures, having each of them their point of sight.

PROB. XV.

To put in Perspective Columns which are parallel to the Picture.

Suppose X to be the Plan of each of these *Columns*: We must put in Perspective all their bases, that is to say, their Geometrical Plan, as the figure shews, (*Plate 21.*) The difficulty is, to determine on what points of these bases we should raise perpendiculars to inclose the visible parts of these *Columns*.

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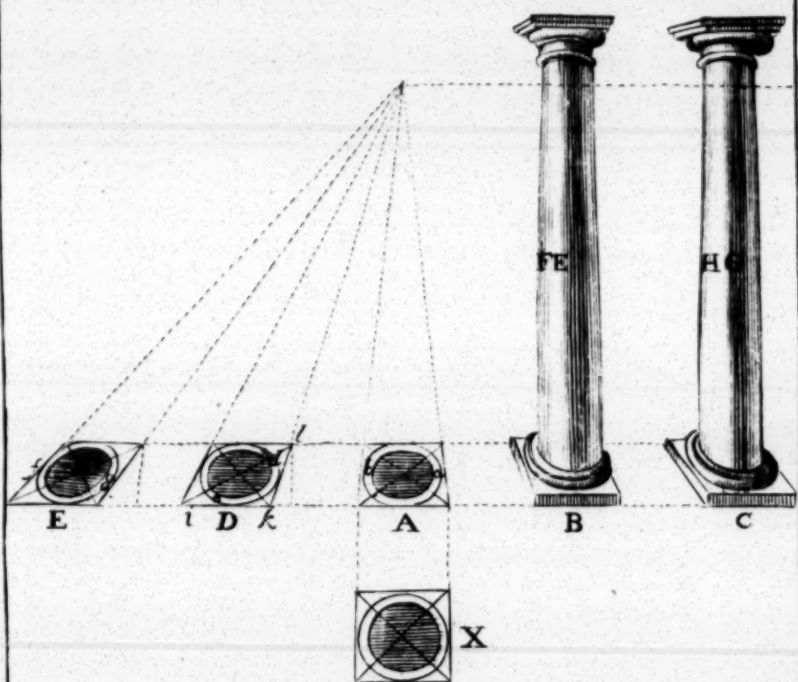
120 *A Treatise of Perspective.*

First, For the *Column* A which is opposite to the Eye, it is evident, that having drawn *ab* the Diameter parallel to the Picture, it is on the points *a* and *b* that we must raise these perpendiculars. So the visible part of the *Column* will fall upon the portion *abc*.

Secondly, In a *Column* we can only see what is betwixt the visual Rayes which touch it, that is to say, the Rayes which are as *Tangents* to the *Column*. We see different parts according as we change our situation; or as the Perspective becomes more distant from the principal point. So that we should be deceiv'd, if on the base of the *Column* E, we raised the sides of the said *Column* upon the extremities *f* and *g* of the diameter *fg* parallel to the Picture; as if in that situation, the same visible part of E were alike to that of A.

Thirdly, What must then be done? If we raise a *Pilaster* on D, we shall see two faces raised on *ik* and *kl*. Now a *Column* is a *Pilaster* whose angles are cut off; so it is upon the points *d* and *o* where the Diagonal cuts the Circle (or Perspective of the Circle) which is the base of the *Column*, that we must raise the perpendiculars, and we shall see, that by this Rule we represent only that part of the *Column* which is visible.

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A Treatise of Perspective. 121

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According to what we have said, *Columns* are *Pilasters* whose angles are taken away. We may then distinguish in each visible part of a *Column*, two parts that answer to the two faces of a *Pilaster*, as in the *Columns* B and C, F and H answers to the face which is in front, and E and G to that which is on the side. The parts F and H are always equal, but E and G unequal, as we have shewn in *Pilasters*. This is the reason why *Columns* parallel to the *Picture*, when they are remote from the principal point, ought to appear more gross, which makes a bad prospect; because if their distance were infinite, they must be infinitely gross; but this never happens, for the Eye, continuing fixed on a certain point of sight, cannot see to the right and to the left, but in a limited extent, unless the Eye be infinitely distant; and then all the *Columns* being confused, the excess of the one half above the other in their Perspective, cannot be sensible.

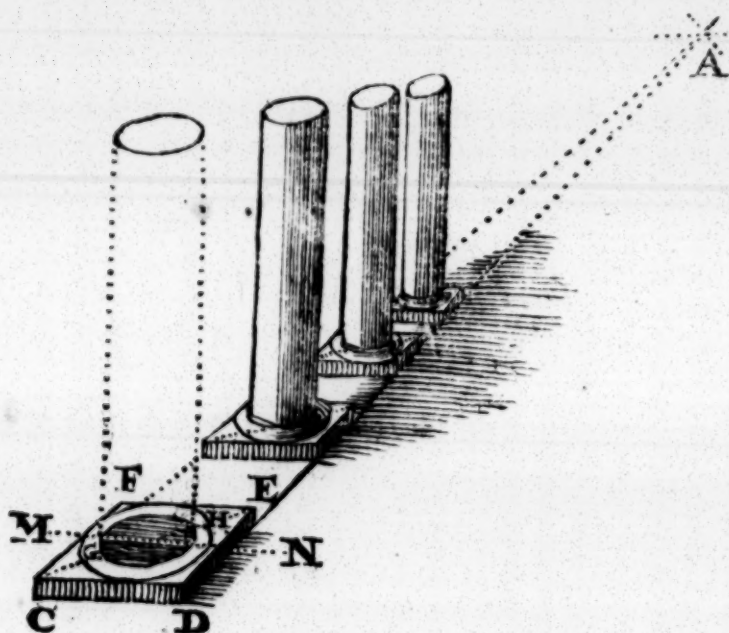
PROB. XVI.

To put in Perspective a Gallery adorned with Pilasters and Columns.

The first thing to be done, is to put the *Ichnography* or Plan of this Gallery in Perspective; and if they be *Pilasters* to raise perpendiculars

122 *A Treatise of Perspective.*

pendiculars on the Plans of their bases, as we did in the 13th Problem. But if they be *Columns*, we must mark the Squares which incloses their bases as here C D E F; and having drawn the Diagonal C E, raise two perpendiculars on the points G and H, where this Diagonal cuts the crooked line, which is the Perspective of the foot of the *Column*; as we have told in the foregoing Problem; and as the Figure will give you to understand.



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I do not believe it is possible to find surer and exacter Methods of Practice; I say *more exact*, because I allow this not to be altogether such. It supposes the Eye to see always the

A Treatise of Perspective. 123

the half of a *Column*, which is not true. If the *Column* be large, the two Rayes which touch the crooked line G H G in the points G and H, cannot reunite in the same point, to wit, the Eye. Neither is it true that the two perpendiculars which inclose the *Column*, ought to be raised on the points of the base, where a Diameter parallel to C D, such as M N, cuts this base; for it is evident, that 'tis not that part of the *Column* which is seen, when the point of sight is in A.

PROB. XVII.

To put a succession of Pillars, or Statues, in Perspective, or a Row or Alley of Trees.

The Plan must first be put in Perspective. If all these Trees and Terms are equal, and the Statues alike, all we have to do, is to diminish them in proportion to their distance. Now we have already shewn, that it is easie to find the Perspective bigness of an Object; so when a Painter knows, that where he places a certain Figure, it ought (*for instance*) to be a fourth part less, than if he placed it on the fore part of the *Picture*; there is no doubt but he must make it a fourth part less. It is the same with a Term or a Tree. All Books of Perspective are full of Figures, shewing how to practise the Problems which are here proposed.

PROB.

124 *A Treatise of Perspective.*

PROB. XVIII.

To put a hollow body in Perspective.

Every body, of whatever Figure, is inclosed by the lines which measure it, and certain principal points which terminate its Figure. So to put in Perspective a body of any sort of Figure, we need only to find the Perspectives of its principal lines and points. I suppose its situation, in respect to the *Picture*, to be known: To put the hollow body X in Perspective; this body is comprehended between eight faces, such as **A B C D**; its height is **A B**; the figure of its bottom is **A E F G H D**; that of its overture is **B C I K** alike and similar (see *Plate 22. Fig. 1.*) To put then this hollow body in Perspective, we must *First* find the Perspective of **A E F G H D**, then the Perspective of the perpendiculars **A B** and **D C**, and of the others which measure the height of X, and by joyning their tops, we have the Perspective of X, as is evident; but that the Perspective may have its effect, and that X may appear hollow, it must be shadowed as you see. The Figure alone is sufficient to make us comprehend how to put the body Z in Perspective (see *Plate 22. Fig. 2.*) We must find the Perspective of its Plan, and of its principal lines, and then shadow the parts which are not exposed to the light, as we see in the Figure.

PROB.

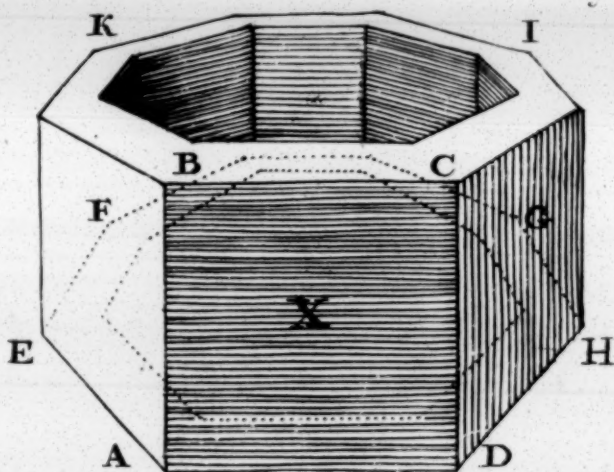
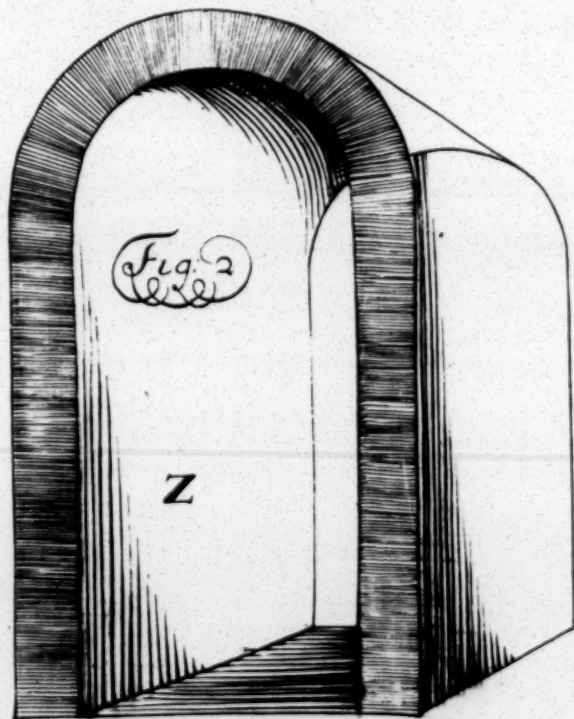


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A Treatise of Perspective. 125

PROB. XIX.

How to put all sorts of Objects in Perspective.

Perspective, as we have already said, teacheth not how to Design, how to paint Men, Beasts, Trees, and *Architecture*; all we ought to expect from a *Treatise of Perspective*, is to know how to put the principal points of an Object, and the principal lines which shew its Dimensions, in Perspective. The rest is the business of a *Painter*, or of one who can Design. So that if it be a piece of *Architecture* which we would put in *Perspective*, after having agreed on the place it is to have in the *Picture*, and on its largeness, if we understand not *Architecture*, we must employ one that knows how to design it; or if it be a Figure, we must imploy a *Painter* who knows the design.

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C H A P. VII.

Of Pictures which are not perpendicular on the Geometrical Plan; which are inclined or parallel to the Horizon; which are sloping in respect of the Eye; and lastly, of those which rest on an unequal and irregular ground.

Hitherto we have supposed the ground of the *Picture* level and plain; and placed Vertically, that is to say, perpendicular on the Horizon, and seen in front. Let us see what is to be observed in all the other situations it may be supposed to have; whether it be on a Plan, or on a place *Concave* or *Convex*, in a *Ceiling*, or in a *Vault*, on a Wall in which there are Cavities, and *Sallying* or *Re-entring* Angles, or on an unequal and irregular Ground. All this requires no other Rules than those we have already proposed; but it is necessary to be well understood.

What-

A Treatise of Perspective. 127

Whatever be the situation of a *Picture*, or whatever its ground be, 'tis easy to make appear there, whatever is possible to be represented in a common *Picture*, in following still the same Rules. The situation of a *Picture*, whatever it be, may be easily reduced to that of a *Vertical Picture*. To that end we must suppose the difference to be in the situation of the Spectator. As if (*for instance*) the *Picture* be parallel to the Horizon, we need only suppose the Spectator, not to be standing, but lying upon the ground, and consequently parallel to the Horizon; and then the *Picture* hath its ordinary situation with respect to the Spectator. We have shewn, that bodies Concave, Convex, or Rugged, if seen from a-far, appear flat and even; that the greatest parts appear small; and so consequently those that are unequal, may have the same appearance as if they were all equal. We may then divide an uneven ground of any figure, so as to make it appear even, and composed of equal parts. Consequently if we there paint things according to the extent of the place, that is to say, making that to be greater that is in a greater place; if we paint two different parts of a Man, that are equal, as (*for instance*) the two Eyes in two places of a different bigness, this Painting, which if seen near, would appear

128 *A Treatise of Perspective.*

pear deformed and without proportion, yet if seen from a-far, may have an agreeable appearance; because what is unequal appears equal; and so these two Eyes unequal in the place where they are painted, shall have an equal appearance:

A general expedient, for succeeding in all the sorts of Painting we speak of in this Chapter, and for doing things easily, is to make a *Picture* on an even ground perpendicular to the Horizon, and such as we would have that appear which is painted on a ground that is not so, or that hath not an ordinary situation. There is a necessity of making this first *Picture*, even then when we undertake to work on a level ground, which hath nevertheless inconvenient situations, in which it is difficult to take all its measures. I do not except even the Vertical Pictures; if it ought to be placed much above the Eye, apply'd to a Wall, and seen at a distance, in which it will not be necessary to raise the Eyes too much, nor to turn the Head backwards to consider it; for then the point of sight would be much lower than the *Picture*; and so the performance would be very troublesome. Now to avoid what difficulty may happen in this case, make a rude draught or model in small, of the great *Picture* which is to be work'd.

This

A Treatise of Perspective. 129

This may be easily understood; for to make this Model, give the Cloath the same measures as you give to the great *Picture*, only reduced; that is to say, supposing (*for instance*) that the true *Picture* ought to be of 2 foot; and that the principal point should be as many feet below the base of the *Picture*, take the Cloath of 20 Inches, and place the principal point 20 Inches below this Cloath. There we paint the rude draught or model of the great *Picture*: We divide this rude draught into small Squares, and likewise the Cloath of the great *Picture*; then there is no difficulty, but to represent in each of these Squares, what answers to it in such or such a Square of the Model. This being done, the great *Picture* hath the desir'd effect.

I.

Of Pictures that are inclining or leaning.

This situation requires no new Rules. We must do the same as if the *Picture* were perpendicular to the Horizon: X is a *Picture* inclin'd on the Horizon Z, the point of station is B, and B a the height of the Eye. Suppose the line B A parallel to the *Picture* X, and equal to B a; that is to say, we must imagine that B being still the point of station, the Spectator inclines himself and becomes parallel to the *Picture*. Then A C is the height

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of

130 *A Treatise of Perspective.*

of the Eye, which is situated at the point A. I suppose A D parallel to the Horizon, or to B C; so D is the principal point, or point of sight, and C D is the Vertical line, (see *Plate 23.*) These things being supposed, if E be the visible point, 'tis evident that its Perspective will be F. If the Picture X were not fix'd, that so we could set it upright, and that the line A B became perpendicular on the Plan Z: Then in this new situation the point A would be the same as *a*, and D the same as the point *d*. It remains to prove, that the Perspective of E will, after this change, be in the same point of the *Picture X*. That is to say, that as C D would be the same line as C *d*, so C *f* would be the same line as C F.

A D and *a d* are parallel to B E, and *a d* = A D. So the Triangles *a f d* and C *f* E are similar.

Therefore *a d*, C E :: *d f*, f C.

The Triangles A D F and C F E are likewise similar.

So A D, C E :: D F, F C,
a d, C E :: *d f*, f C.

Now *a d* = A D, and C E = C E:

Then A D, C E :: $\frac{d f, f C}{D F, F C}$

Consequently *d f*, f C :: D F, F C.

So *d f* ÷ f C, f C :: D F ÷ F C, F C.

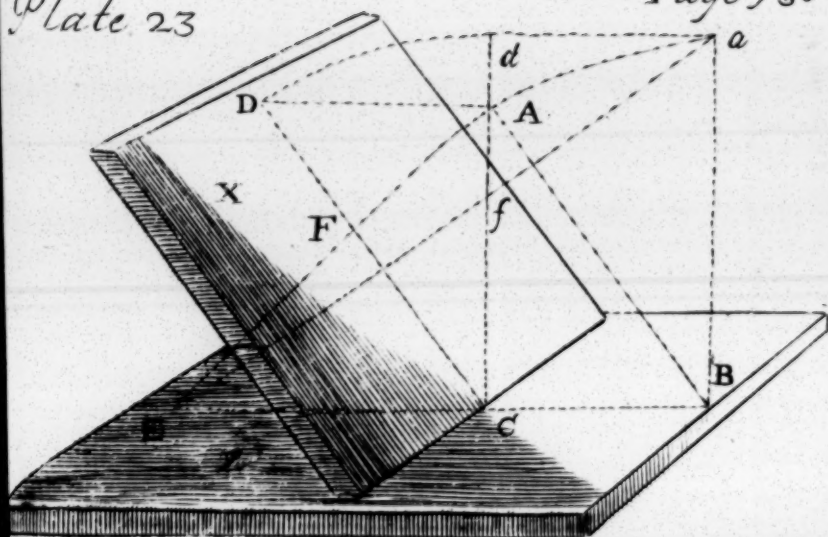
But *d f* ÷ f C = D F ÷ F C. And consequently F C = f C; which was, &c.

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A Treatise of Perspective. 131

Thus we see what is to be done when the Picture is inclin'd in regard of the Eye. If the Picture proposed is X, and the Eye that must see it be in A, we must imagine a parallel to the Vertical line CD, which parallel passes through A the place of the Eye. This parallel is AB. On the point B where this parallel cuts the Horizon Z, we must raise the perpendicular Ba equal to BA. Then there will still be the same point of sight, which will be D or d: So we must draw on this Picture the Perspectives of the Objects proposed, according to the Rules which are given for such Pictures as are perpendicular on the Geometrical Plan. Then giving to the Picture X its first Inclination, and placing the Eye again at A, the Perspective will answer our expectation; that is to say, the Picture will have the appearance which it ought to have in that situation, the Eye being placed at the point A, and the visible Objects having the same disposition in regard to the point A.

II.

Of Pictures parallel to the Horizon.

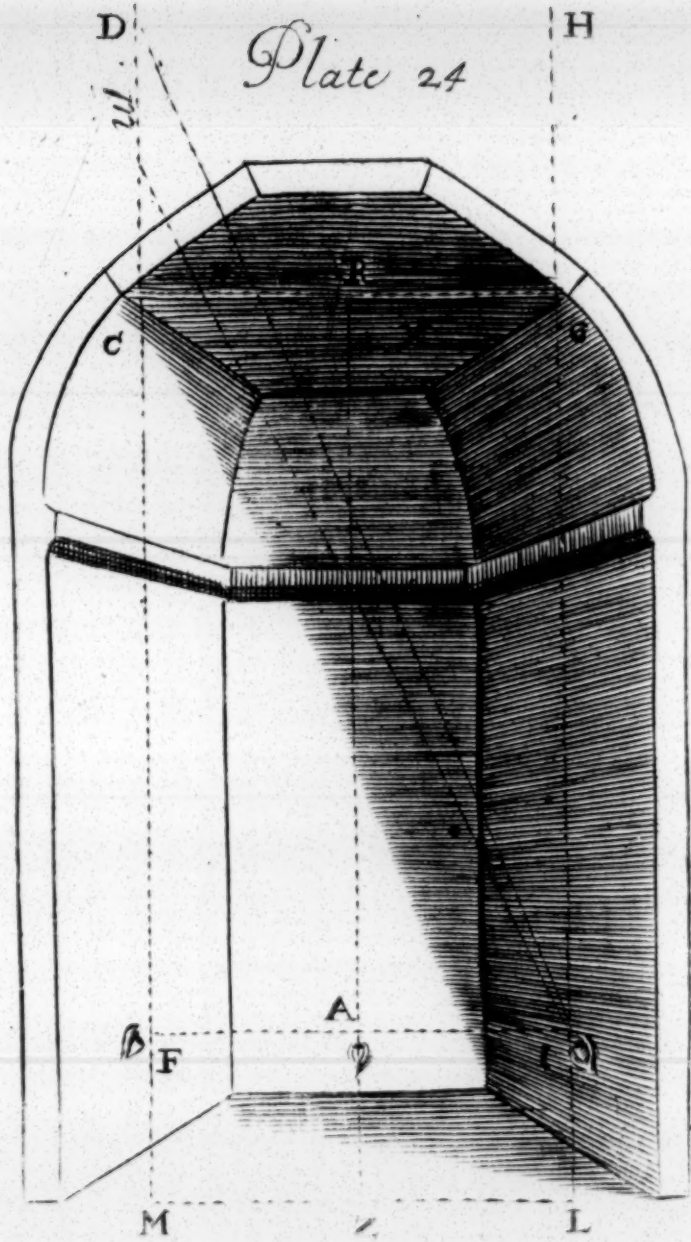
'Tis the same thing whether these Pictures be seen from low to high, as when they are in the *Ceiling* of a Hall; or from high to low,

132 *A Treatise of Perspective.*

as if they were in the *Pavement* of a Church, and were seen from some Gallery. There is nothing particular for such Pictures, the Rules are the same. Suppose *Z* the Horizon, and *X* a Picture parallel to it, placed in the Ceiling, *A* is the Eye, and so *B* is the point of sight, supposing the Eye placed under the Center of the Picture. But because in such a situation we are obliged to turn our heads quite back, which is uneasy, it is more natural to retire from under the Center of the Picture, and then *B* is no more the point of sight. If the Eye be placed in *I*, the point of sight will be in *G*. Suppose then *m* to be the visible Object, the line *D M* may be considered as the Geometrical Plan on which is the line *D m*. The height of the Eye above the Horizon is *I L*; but its height above the Geometrical Plan *M D*, is *I F*, and its distance from the picture *X*, is *I G*. This Picture *X* is perpendicular on *L H*; and so this situation, as we conceive it differs nothing from the ordinary situation, there is therefore no occasion for new Rules to work upon a Picture parallel to the Horizon. It is evident that the Perspective of *m* is *n*, which is found after the same manner, as if the Picture were perpendicular on the Horizon.

When these Pictures, which are situated parallel to the Horizon, are round, or when they

Plate 24





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A Treatise of Perspective. 133

they represent a *Cylindrick* body, or *Polygon*, if the point of sight be not at the Center of the Picture, we must chuse almost as many different points of sight, as the Polygon hath sides; because in such a case the Eye changes its place, to consider the different faces which are raised on each of the sides of the Polygon. For 'tis evident, that to the end the Eye may see an Object which should be in the line *GH*, it must be placed in *F*, and then *LH* represents the Geometrical Plan, *F* is the situation of the Eye, and the letter *C* marks the point of sight.

In the Ceiling of a Room, the point of sight ought to be in a place which may be easily seen, and consequently near the most considerable Door, to the end that the Painting in the Ceiling may be seen from the entry, inviting, as it were, to enter farther, and find out the place from whence it may be seen with most advantage; that is to say, from whence the Figures appear in an agreeable proportion.

If the Ceiling were not even, but like the top of a Coach, we may then represent in it several Objects, or different Complications of Pictures, having each their point of sight; for it is not possible that the Eye, in whatsoever place it may be situated, can at a view comprehend the whole Painting of

134 *A Treatise of Perspective.*

a Ceiling. Therefore it must change place ; and consequently we ought to suppose several points of sight ; but all these pieces of Painting ought to have a relation, and form by a certain union one subject by which the whole Painting is joyn'd. When a Ceiling is only painted with Ornaments, there is no occasion for Perspective, Geometry is sufficient ; that is to say, we must draw each Ornament in its just Measures, as if the Eye were exactly opposite to it.

III.

Of Pictures that stand sideways in respect of the Eye.

A Picture is said to stand sideways in respect of the Eye, when it is not opposite in front. We may consider it in this situation as if it were inclin'd (see *Plate 25.*) The Picture X is sideways in respect of the Eye A ; it is inclin'd on the wall Y, which we may consider as the Geometrical Plan. So that this situation is the same with that of which we spoke in the first Article of this Chapter, and needs no other Rule.

IV. Of

A Treatise of Perspective. 135

IV.

*Of Pictures upon Concave and Convex bodies,
or on such as have Cavities and Eminences.*

Such Pictures ought to be seen only at a great distance, to the end that the Concavity or Convexity of the ground on which they are painted, and the Eminencies and Cavities which are there may not be sensible, because of the great distance; and consequently that the ground may appear equal and flat: And then the parts of such a Picture seen at a distance, appear not what they really are: Those that are great appear small; therefore what is here painted, ought to have quite different Features, from what is drawn in a level Picture seen at a small distance.

The same happens in all sorts of Pictures, which are seen sideways and at a considerable distance. Suppose (*for instance*) the wall Y to be a Picture (see *Plate 25.*) The Eye is in the point A at a distance, which I could not here represent so great as it ought to be imagined. The Picture Y hath unequal parts; *a* is less than *b*, *b* is less than *c*, and *c* is less than *d*. Yet these parts seen from A may appear equal, and have the same appearance as the Picture X. So that instead of representing a Head in the Picture X, where all its

136 *A Treatise of Perspective.*

parts must be done in a natural proportion, as
 • (*for instance*) the Eye must be equal: In the
 Picture Y, the Eye which is in *a*, ought to be
 so much greater than the other Eye, as this
 other is in a place whose appearance is lesser.
 The Figure gives a sufficient Idea of this
 matter here.

In this situation, and generally in all others
 where Painting is to be done on irregular
 bodies, and which ought to be seen from far,
 we must make a Model of what we would
 represent; that is to say, we must paint upon
 a Picture that is level and even, as we have
 already said, whatever we would represent
 on another Picture that is not so. We divide
 the level Picture in several small Squares;
 then make a frame of the same bigness, which
 we divide in equal squares with the help of
 several Threads. This frame we put in the
 place from whence the uneven Picture, whose
 parts are unequal, hath the appearance of the
 Picture which is smooth, and whose parts are
 equal. As here the Picture Y hath the ap-
 pearance of the Picture X. This frame being
 prepared and placed, we put a Candle in the
 point A, where the Spectator is supposed to
 be placed. The shadow of the Threads of
 the frame X, will mark Figures on Y, to re-
 present the Squares of X; so we must trans-
 port what is in each Square of X, into the



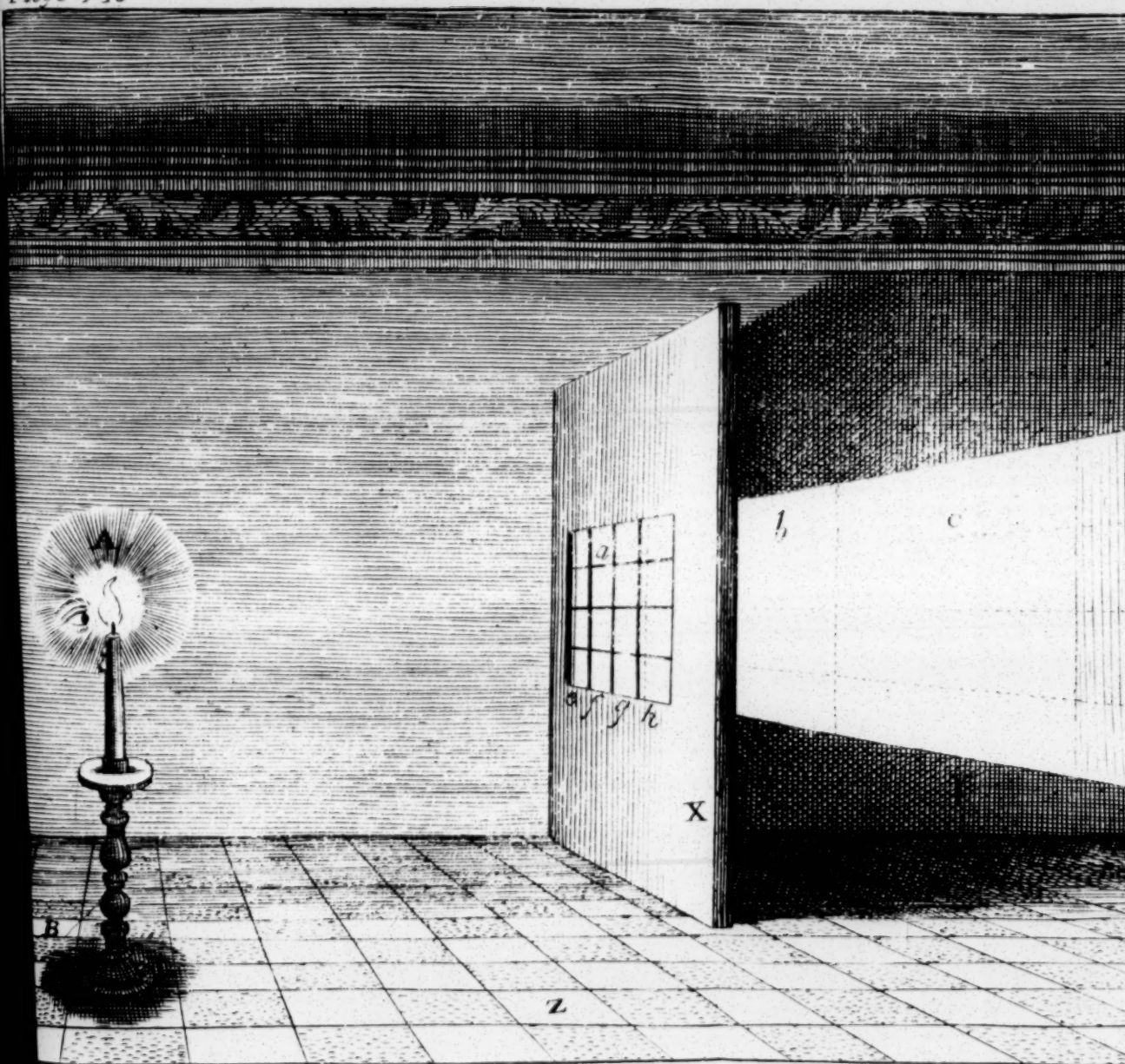
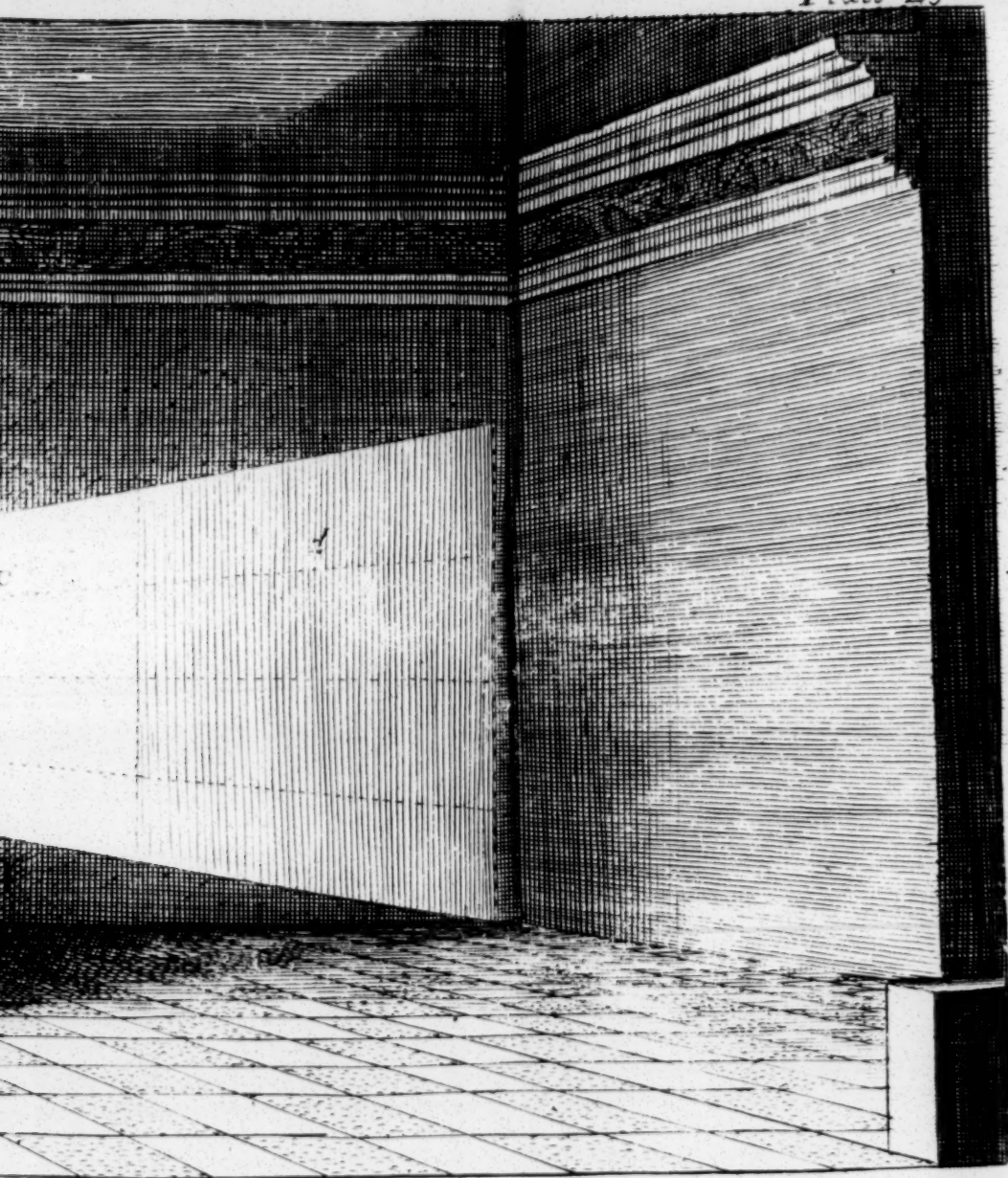


Plate 23



Page 137

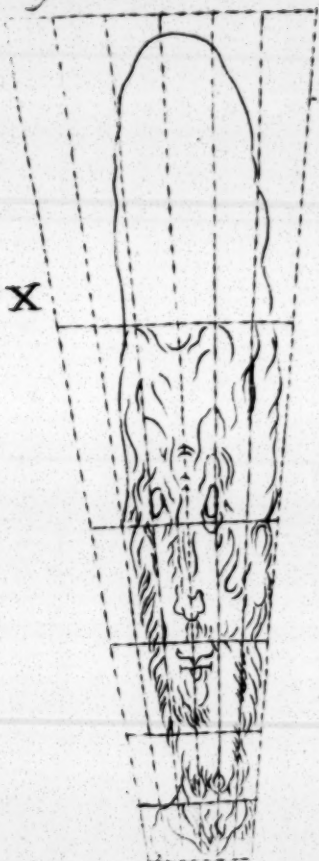
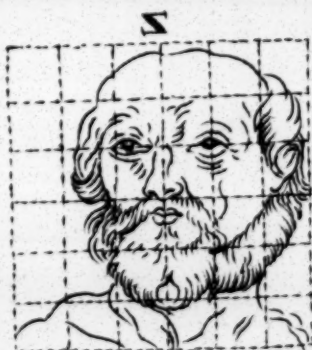


Plate 26



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A Treatise of Perspective. 137

correspondent Figures of Y. The Figure is sufficient to demonstrate this Artifice.

For a clearer light into this matter, consider the Figure representing a proportioned head in the Square Z. If the Figure X were so situated, that from a certain point from whence it might be seen, it would have the appearance of the Square Z; then by observing what parts of Z correspond to those of X, and painting in these last, what is in those of Z; that head in X, which at a near view, appears monstrous, will, if seen from afar, appear proportioned, and every way, like that in Z.

We ought to follow the same method in painting Figures on a Concave place, which should appear upright and perpendicular, as that of our Saviour fix'd to the Cross. A Convexity or Concavity seen from afar, appears flat; so that to paint a Crucifix on that sort of Surfaces, it must not be done in its natural proportion, but in such, as if seen from afar, whatever be the figure or bigness of its parts, they may appear in their just proportion. Such Pictures are not made for a near view.

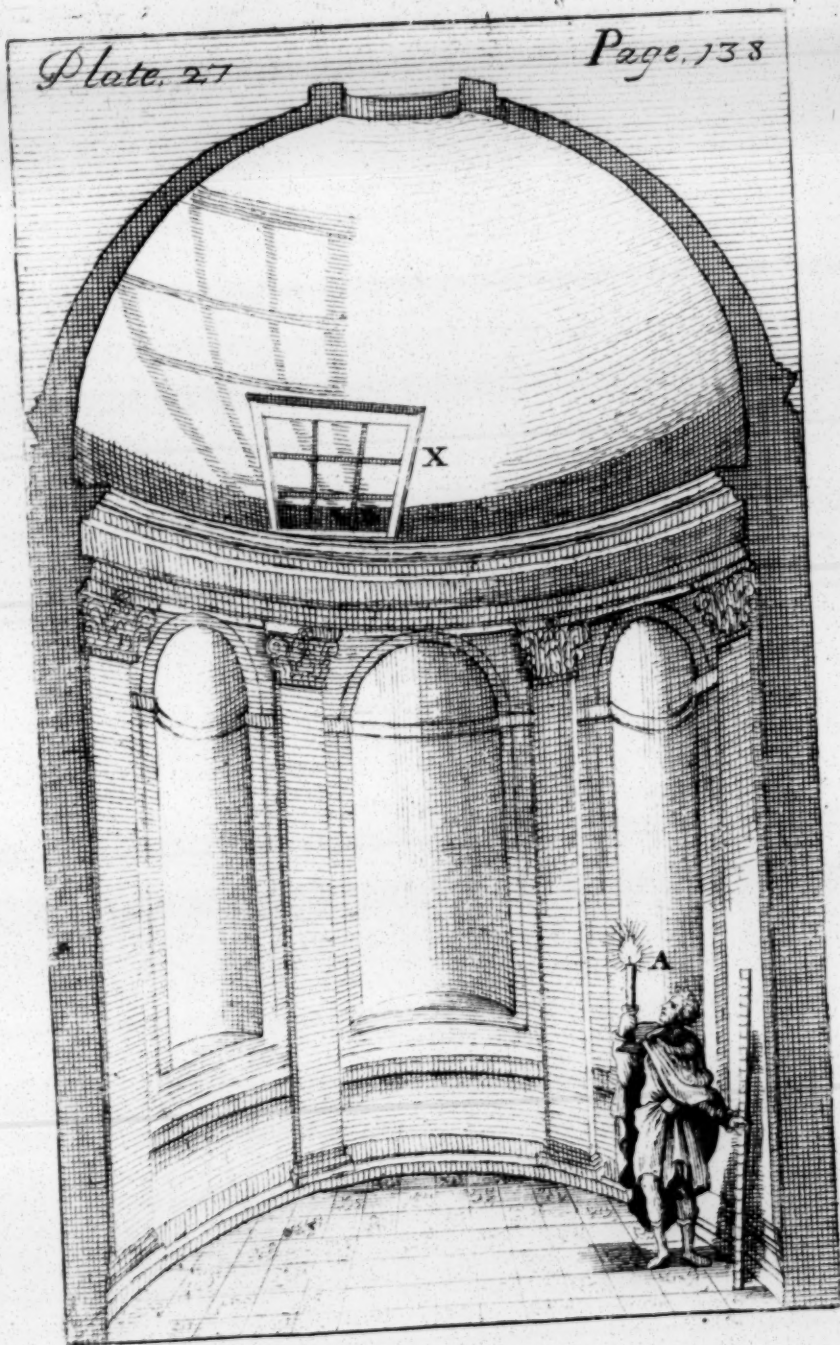
A Painter ought therefore to consider which is the place, where a Convex or Concave Picture, hath the appearance of one smooth and even; it is in this place where he ought to put the frame. The light of the Candle placed

138 *A Treatise of Perspective.*

placed in the point which represents the Eye, will mark in the place that is Concave or Convex, the parts to which every part of the frame answers. So in Painting the same things according to the proportion that is betwixt the Squares of the Concave or Convex Picture, and the Squares of the frame, the appearance ought to be the same.

To do this sort of Perspectives after an easy Method, some pretend to prick all the features of the Model, and place it as the Picture is here, (see *Plate 27.*) for the light of the Flamboy A which passes through these little holes, will delineate all the features of this Perspective. But let us consider well, that the light which passes through these small holes, as it spreads it weakens; so that it can never denote at a great distance the features of the Model that is prick'd, through which it passes.

Whatever Method is used, such Perspectives may be made to surprize those that see them near and at a distance. If (*for instance*) we would paint St. John the Evangelist on a wall, with a green Habit and a blew Mantle; we may paint in the Perspective, Meadows, Fields, Forrests and Seas. If his Girdle be white, there we may paint Streams of Water; likewise Lakes in the place where his Gospel is opened, and shews the Leaves white and extended. But all such Figures as are different from the
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A Treatise of Perspective. 139

natural Features of the principal Figure, must be so small, that from the point from whence the Perspective is to be seen, they have no appearance; and their colours must agree with those of the principal Figure, and promote its best appearance. Much after the same manner we may represent in this Perspective, small Creatures, Fishers, Ships, Birds, and a thousand other things, which at a distance will not appear, their Features losing themselves because of their smallness, and their colours being confounded by that of the Habits of *St. John*, which is the same. Nevertheless all these little Figures, if seen near at hand, make the Perspective so different from a *St. John*, that one would not think it could ever represent him, be it seen from what place it will.

I have already said, that this sort of Perspectives shew best in a long Gallery. To render them more surprising, they are shewed through a hole at the door, to which is applied a Prospective with two Glasses; so that tho' the Image of *St. John* be turned up-side down, this Image appears upright, which makes the Perspective yet more confused, and *St. John* less easy to be known; for we can conceive nothing in its proper Features, nor can we perceive any relation to these small Figures, which might have been
made

140 *A Treatise of Perspective.*

made upright. This only happens when we see the Perspective at a near view.

V.

Of Pictures and Statues made to be placed in high and eminent places.

After what we have said, it will be needless to acquaint you again, that in Pictures which are upon flat and smooth grounds, but yet are placed much above the Eye, things ought not to be represented in their natural proportion; this must be understood of *Sculpture* as well as *Painting*. In such a case, if we would have things appear what they are, we must paint them otherwise than they are. (*For instance,*) In making a Picture of our Saviour for a very high place, to the end that his Head may not appear too small in respect to the rest of his Body, it must be made greater. The highest parts which are seen under greatest Angles, appearing smaller than they are, ought to have a more than natural size, to the end they may seem to be of a natural size. That is to say, in the Example proposed, that the Head of Christ ought to be bigger, to bear proportion to the other parts of his Body, which being lower, and nearer the sight, preserve better the appearance of their true size.

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A Treatise of Perspective. 141

Tzetzes relates a History which suits to our purpose: He says, that the *Athenians* having resolved to place the Statue of *Minerva* on a high Column, gave orders to *Phidias* and *Alcamenes* to make each of them a Statue of this Goddess, designing to dedicate to her the finest of the two; *Alcamenes* made the Figure of *Minerva*, very fine, with an agreeable Visage; there could be nothing finer, when seen near; every one went to his Work-house to see it with Admiration. *Phidias*, on the contrary, made her Figure quite otherwise; he placed her Lips in a wide distance, her Mouth open, and her Nostrils large and great. These great parts had no beautiful Aspect in his Work-house, for which reason he was to be ston'd by the People. But when the two Statues were put in their places, that of *Phidias* appeared with all the Beauty that could be desired, and was much esteemed by the *Athenians*: And that of *Alcamenes* lost all its Grace, and appeared ugly and ridiculous. There is likewise a Rule, that in all large Gigantick Statues, no part ought to be made fine; it is enough that it appears as if it were hammered out; because, besides its being needless to make it otherwise, what is rough appears best at a distance, as being more palpable.

Painting

Painting and *Sculpture* have nature for their Object; they try to represent it; it ought therefore to appear in their Works what it really is. Nothing must appear too small, or too great, in their Mixture. Thus a great Figure, which exceeds the natural size, does not well, unless it be so remote, as to appear in its natural magnitude. This was observed in the two finest Monuments now remaining of ancient *Rome*, namely, the *Trajan* and *Antonine* Columns. This last is 175 foot high, and that of *Trajan* is 140. The proportion of all the Figures of the Relieves that cover these Columns, answers to their situation; for their parts enlarge as they mount farther from the Eye; so that those which are on the top of the Column, are as well seen, as those which are below; and all is so equal, (as *M. Ragenet*, who has lately given us a Description of these Monuments observes) that the Soul deceived by the Eyes, does not think of the difference of the situation of Objects, which must of consequence sink the difference of their Grandure.

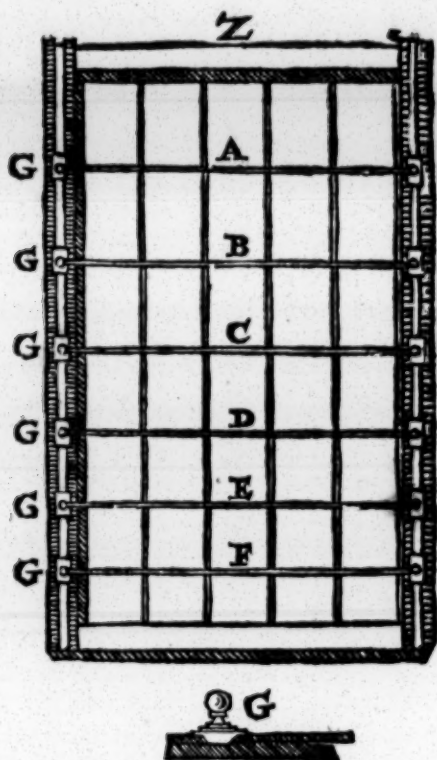
There is no certain Rule for judging what ought to be the grandure of a Statue placed in a high place, to the end it may appear in its natural size. Father *Tacquet*'s Rule agrees not with Experience; it does not satisfy the Eye.

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Eye. This is what obliges Painters, Carvers, and Architects, in Works of consequence, to make Experiments to know what size a Statue ought to have in a place, where it is to be put, to the end it may appear in a reasonable bigness from the place from whence it is to be seen. We have already observed, that it is not the distance alone, the remoteness, or the height, that can prescribe a certain Rule. The Disposition of the place, and the Intermixture of bodies, supporting the sight, makes us judge an Object to be greater or lesser according as we perceive more things interposed. It is thus that we take the Sun and Moon to be smaller, when they are above our Heads.

We must therefore on all occasions have recourse to Experience. We have shewn that this may be done by applying a Frame to the place appointed. I shall here add, That to know the true size that an Object ought to have in that place, to the end it may appear proportionable, the Lines or Rulers of this Frame which are parallel, ought to be moveable, like those of the frame Z. Consider one of these Rulers, the Figure G shews how they may move and remain parallel. This frame Z must be put in the same place where the Picture, Statue, or any other piece of Work is to be; Remove or approach the
Lines



Lines of this Frame, till they appear equally distant one from another ; that is to say, till the Intervals A, B, C, D, E, F, appear equal. There is a necessity for their being so, and 'tis the real inequality of these Intervals, which shews how much we must augment the different parts of a Statue, according to the appearance we would have it make. It suffices sometimes to place a course gross body, in the place where the Statue is to stand, and to diminish and augment it till it appears in the natural size of what we would have

A Treatise of Perspective. 145

have the Statue represent. These Experiences are very necessary. The other Rules which are given, are false, because they suppose that things seen under equal Angles, appear equal. I do not pretend to advise Painters what Subjects they ought to chuse for their Pictures; but in speaking of such as are parallel to the Horizon, or inclined, and in general of all those which have a situation uncommon, I cannot forbear saying, that they ought never to represent, but what is convenient for the place where the Picture is to be put. It is not proper to paint any thing in a Ceiling, but what may appear in the Air, and be above our Heads. So that it would be ridiculous to paint Ships and Shipwracks in such a place.

We must nevertheless acknowledge, that the best Painters have not observed this Rule: *Dominick Zampietri*, called commonly the *Dominican*, a Native of *Bologna* in *Italy*, painted in the Vault of the Church of *St. Andrew of the Valley*, a Picture of our Saviour, who from the edge of the Lake of *Genesareth*, discovering *Simon* and *Andrew* in a Bark, calls them to him to be two of his Disciples. This Painting appeared so excellent to *M. Raguenet*, that he allotted it the first place in his Description of the Monuments of *Rome*.

146 *A Treatise of Perspective.*

I may be allowed to say, that *Helie* snatched away in a flying Chariot, the Rapture of *St. Paul*, or the Assumption of the Virgin *Mary*, would be more agreeable to a Vault: But in these Paintings, as in all others, the Pencil of a Painter does more than the Calculation of a Mathematician. The principal thing in it, is, That it depends upon a certain Posture, which makes (*for instance*) the Blessed Virgin, in her Assumption, mount in our view, that the more we behold the Chariot of *Helie*, the more we believe it really to fly.

The *Ganimedes* carried away by *Jupiter* in the form of an Eagle, designed by *Michael Angelo*, is much admired. *M. Raguenet*, in describing this piece, says, the Posture that this Famous Painter hath given to these two Figures, namely, the *Ganimede* and the *Eagle*, is wonderful; for the Bird so intangles him, with his Neck and one of his Talons, that he holds him with an invincible force, neither can he hinder him from taking his flight. One of his Talons alone, with which he surrounds the Leg of *Ganimedes*, and his Head and Neck with which he encompasses the Body of that young Man, commands him so much, that he has the motion of his Wings free to fly, without suffering his Prey to escape. I make these Remarks, to the end

none

A Treatise of Perspective. 147

none may imagine, I pretend that a Mathematician, without being a Painter, can perform any thing in Perspective.

We have said, that nothing ought to be represented in a Ceiling, but what may reasonably be imagined to be there. Yet if we paint there a *Capola* with Niches, we may represent Figures, which may appear standing. 'Tis in such occasions that Perspective is wonderful. Amongst the Monuments of *Rome* is reckoned, the Perspective which the Father *Mathew Zacolino Theatin* made in the Vault of the Church of *St. Silvestre a Monte Cavallo*. He has represented a Dome in the Quire of that Church with such Art, that the most curious Eyes are deceived; neither can Reason correct the Error of the Eyes. It cannot be imagined, but that there is a Cavity in the Vault, at the place where this Dome is painted, and yet all is smooth and even. Near this Dome is seen a small Angel painted in the Mould of an Arch, which commences the Vault of the Quire; and never did any piece of Painting appear so truly embossed as that is. This Angel seems to be clear of the Vault, not touching it but with his Head. *M. Raguenet* says, 'Tis impossible to carry Imposture farther. The knowledge of the Rules we have given, was necessary to him that painted this Perspective; But he is still

148 *A Treatise of Perspective.*

more obliged to *Painting* than to the *Mathematicks*.

Before we finish this Article, let us say once more, that a rational Soul can never be satisfied with what is not likely. We cannot but be offended to see a weighty thing bear false; I say, a heavy thing; for if it had any levity, such as the Air could support, and the Winds carry, it might then be represented without any support, in the Air, like Birds that have Wings. There is something miraculous in the Rape of *Helie*, so that it is not offensive to see her in a flying Chariot; but when a Man has not an extraordinary Talent, he should not be allowed to represent any thing inclining, if he do not at the same time allow it a support.

It is likewise a palpable fault, to place a Picture near the Eyes, when it cannot perform its effect but at a distance. Such are all the Pictures which have the situation, treated of in this Chapter. A Ceiling should be lofty; a Concavity or a Convexity are not proper for Representations, if they be not at a great distance from the Eye of the Spectator.

To conclude, I'll say freely, tho' I controul the Practice of most Painters, that their performance in Pictures to be placed much above the Eye, is not tolerable. They suppose the point of sight above the ground line,
and

A Treatise of Perspective. 149

and therefore they represent there all the Geometrical Plan. If they paint a Chamber, we see the Pavement: Now this can never be, for a Picture being as a Window, can we see a Horizontal Plan of an equal height with that Window, if this Window were much above the Eye. On such occasions a wise Painter should suppose his point of sight where it ought to be, above the ground line, and so neither suffer his Geometrical Plan, nor the feet of his Figures which are not on the ground line, or too near, to appear; unless we may suppose them to be in some high place, or on a Hill, that the Picture would suffer to appear if it were a Window, tho' the Spectator were in a low place.

C H A P. VIII.

*Shewing that the most important
Rules for laying on of Colours,
proceed from Perspective.*

P*ainting*, by the means of Light and Shadow, shews *Cavities* and *Eminencies* where all is flat. It can represent the Colour of every thing in particular, in all the degrees of Strength or Faintness, and according to the Changes which the Colours of neighbouring Bodies make on its proper colour. For distance does not only weaken and deface the Colours, but the opposition of those that are near, alters and changes them. It is a different thing to see a Flower alone, and to see it in a Garden with others: This variety of Colours occasions a new one, which unites all the rest. So that when a *Painter* is not ingenious in representing this union, all his Colours contradict and spoil each other. The diversity of Colours, and how they enliven and weaken by infinite degrees, is a thing to be admired. An Arm of admirable whiteness, exactly the same in all its parts, is not equally white in respect to the Eyes
of

A Treatise of Perspective. 151

of those that see it, its whiteness differs according as it is exposed to the light, as its parts are higher or lower, near or distant from the Eye, and 'tis by this we judge it to be round. Its whiteness cannot then be represented, but by the different degrees of whiteness which we give it in *Painting*. 'Tis not enough to shadow some parts of it, and to strengthen these shadows, it ought still to appear what it is, truly white: So that it is only by a seasonable lessening or augmenting its whiteness, that we make it appear round, without changing its colour.

Painters call an artificial Colour *Teint*; and *Semiteint* implies, the diverse Colours as they are clearer or darker, more lively or more dull. 'Tis the Light and Darkeness, the Black and the White, that cause the appearance of a *Relieve* or emboss'd Work.

'Tis not my business to speak of Colours; yet since the subject requires it, I shall copy what is said by those who have writ of *Painting*. Good Colour, say they, is that which hath the nearest resemblance to Nature; when the Objects painted have the same Colour, and the same Teint, as the Natural; When the *Carnations* (by which *Painters* mean the naked parts of a Figure) appear like true Flesh, whether it be in the light

152 *A Treatise of Perspective.*

or shadow: When the Drapery resembles Stuffs of Silk, Wool, or any other matter; and when these Colours keep their natural Lustre, which is called Freshness. Finally, Colouring well, is, when the Colours have nothing that is too strong to fix and retain the sight more in one place than another; or when there is not in the Work any one Colour too universally spread over the whole; when neither the Black nor the White, the Yellow nor the Red, nor any other Colour reigns, but an agreeable Variety of several Tints agreeing together, both in the Light and Shadow.

Painters do always suppose a principal Light falling on the middle of the *Picture*, where they place what is most remarkable; and as the Colour reflects all round, what is in the middle is most enlightned, and the rest appears by reflection. All the Colours are confus'd at a distance; so that the Objects which are at the Extremity, ought to come near to the colour of the Sky, or of the ground of the *Picture*. *Painters*, under the name of *Aerial Perspective*, comprehend the Science that is necessary to make Objects seem to shun or to approach us, by a successive order of Tints. This belongs not to the *Mathematicks*; for Colours are different things from Lines and Features: Yet the Art

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A Treatise of Perspective. 153

which we have shewn, will be a great help for the more judicious application of Colours; and 'tis that which remains to be explain'd in this Treatise.

To grind and mix the Colours, is the business of a *Mechanick*. It belongs to an Artisan to know the Effects of Blew and Red, and what may make those Colours more lively or more dull, more clear or more obscure. It is likewise the Experience which is got in working, that makes us observe the different Effects of Colours according to the situation they are in, and the Changes occasioned by a great Light, or according as an Object is supposed to be exposed to a greater Light. These things I meddle not with. Yet a *Philosopher* who knows perfectly the Nature of Colours, (which is yet a Secret) might give good Instructions to *Painters*; but this does not any way concern what I am to say here, concerning the Perfection of the Art I treat of.

That which concerns the Diminution of Lines in the Plan of the *Picture*, according as the Lines are represented distant or more near, is called *Lineal Perspective*; and the Diminution of the Tints and Colours, as we have already said, is called *Aerial Perspective*. This last may be assisted by the first; for what does a *Painter* in applying his Colours,
does

154 *A Treatise of Perspective.*

does he not, in some manner, draw the Lines with his Pencil? Now he cannot do this exactly, if he does not draw these Lines according to the Rules which I have proposed. To explain this,

There needs no great Art in representing a Body which is flat and smooth, one colour is sufficient; neither need we weaken or fortify this colour in any of its parts, because we suppose it entirely alike without any difference. It is not the same in *Relief* work. A Statue, tho' all made of the same Metal, and coloured with the same sort of Colour, cannot be represented but by varying of its colour; for as all its parts are not turned after the same manner, and some advance or fall back, so they are not equally exposed to the light; and consequently there is a difference in their colour. Their being differently exposed to the light, causes a change, and occasions that amongst its different parts, some have the same colour clearer than others. These Alterations follow the different turnings or Features of the Objects. Therefore the Science of Shadows, or of what is called the Clear and the Obscure, depends on *Lineal Perspective*, which is only capable of finding these Lines by Art.

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A Treatise of Perspective. 155

To conceive this more clearly, and to convince our selves of the usefulness of *Perspective* in applying of Colours, let us give attention to Experience, *viz.* That there is nothing but what may be imitated and represented with one Colour, with Ink, or with red or black Pastil. We may give Life to a Design, only by drawing the Outlines. Now *Perspective* is necessary in the drawing of those Lines, which are as guides to the Pencil of a *Painter*, as we have said.

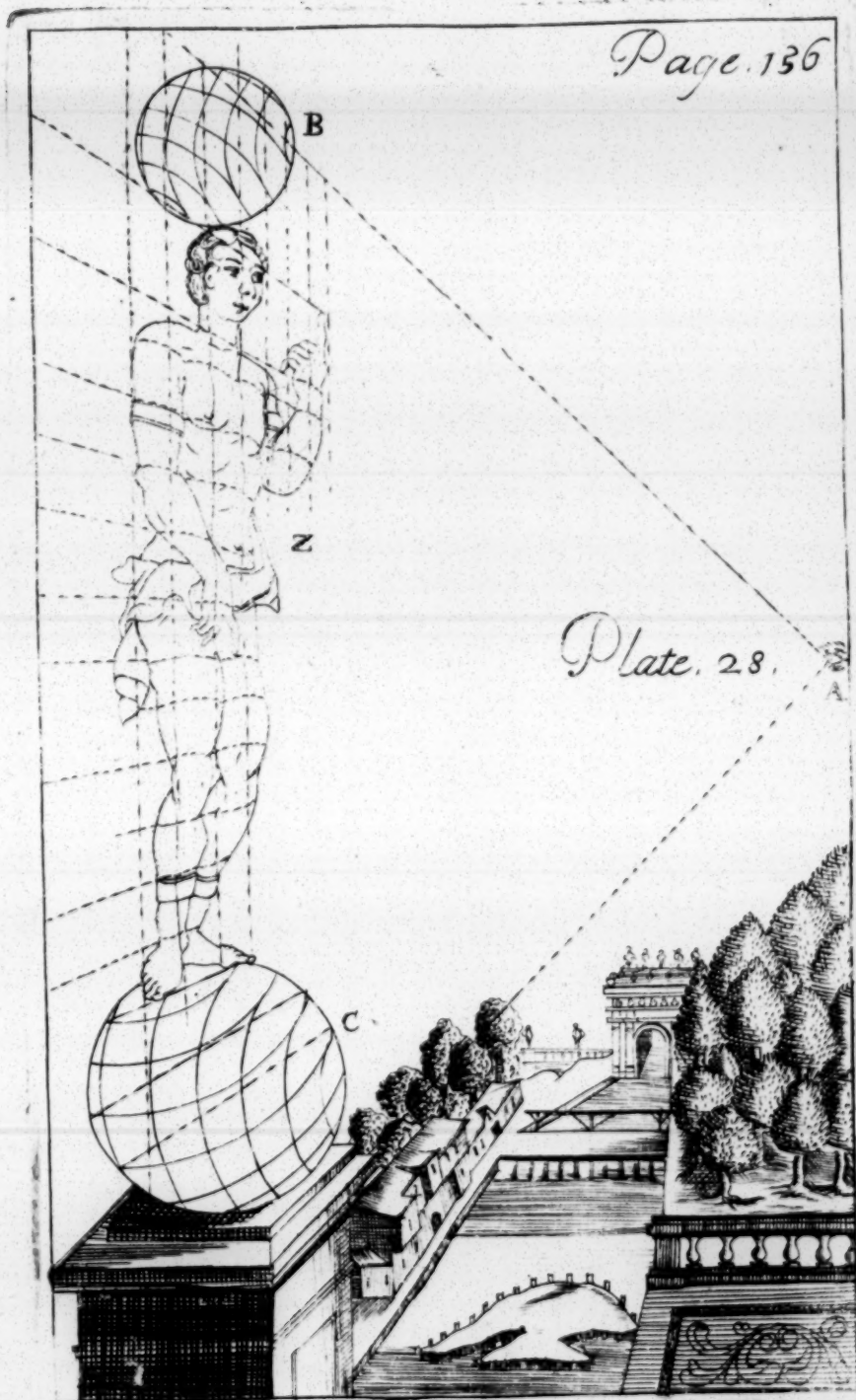
Let us imagine a Statue made of Plans of an equal thickness, placed parallel the one above the other, so as if the Extremities of these Plans should appear, the Statue would seem to be covered all over with parallel Lines or Strokes. Suppose this Statue is to be imitated or represented. It is certain, that if we find the Perspectives of the parallel strokes of this Figure, we shall make a perfect Image. It would be an infinite trouble if we were obliged to find all these strokes by the Rules; but it may be done exactly enough, by the Eye, provided we observe what hath been demonstrated, that what is parallel in the Object, is not always so in the Representation; and that except what is level with the Eye, and exactly
opposite

156 *A Treatise of Perspective.*

opposite to it, nothing continues parallel; that so those of the parallel Strokes or Lines, which are above the Eye, in the parts which are most distant, seem to descend; and that on the contrary, the strokes seem to mount in those which are below the Eye, and at a distance, (see *Plate 28.*) This may be observed in the Statue Z, which I suppose made of parallel Plans, as I have said, tho' they could not be all mark'd: Excepting the Plan which is exactly opposite, and level with the Eye A, the extremities of the others mount or descend according as they are higher or lower than the Eye A. We see likewise the effects of the *Opticks* in the two Globes B and C, whose strokes are differently turned, because those of the Globe C, seen from high to low, ought not to have the same appearance as those of the Globe B, which is seen from below to above by the Eye A. This Figure expresses my meaning but very imperfectly; but a small attention will easily supply what neither my words nor the *Engravers* Art could explain. We may easily conjecture what ought to be the appearance of these parallel strokes of this Statue. Now Experience shews, that nothing can be more capable of giving Life to a *Picture*, than an exact observance of these

Page. 136

Plate. 28.





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A Treatise of Perspective. 157

these Lines. This Experience we have in the Prints where *Engravers* represent threads of Drapery; all these threads are parallel amongst themselves in their ordinary Disposition, when the stuff is extended in the Loom; but this Parallelism changes, and each line turns after they are cut, or made in a Habit; and that the Stuff is differently folded. When *Engravers* know how to imitate this Description, when they express the turnings of those threads as *Perspective* requires; then the Image of what they represent, hath a roundness equal to that of the best *Pictures*; for it is not the Colours alone that makes the Relief, but the Strokes of the Pencil, when they are done by the Rules of *Perspective*.

We may likewise suppose the Statue Z to be made of Plans placed parallel but vertically; that is to say, that this Statue is made so, that the Plans of which it is composed are vertical. It must be covered with Lines which we may imagine in all sorts of Objects. These Lines will be imaginary; but there are some that are real, which determine the out-strokes of an Object; and these are the Lines which a *Painter* ought to follow, and by which he ought
to

158 *A Treatise of Perspective.*

to regulate his Teint : It is impossible to mention every thing we ought to observe. In Representations of *Architecture*, each Stroke or Feature ought to be suitable to the things ; so to represent a thing that is perpendicular, the Lines which make the Shadows should cross each other perpendicularly. If we suppose an *Architecture* covered with Lines, we must of necessity suppose a great number, which determine the parts of this *Architecture*, and mark out its measures. If I say, we suppose an *Architecture* composed of Lines, these Lines must be represented as is taught by *Perspective* ; that is to say, as they ought to appear. Those which are the *Perspectives* of Lines parallel to the *Picture*, ought to continue parallel to each other ; those which are perpendicular to it, should lose and confuse themselves in the principal Point.

What I have said is sufficient : There remains nothing more to be done before I finish this Treatise, but to speak of the Shadows. I shall say no more of Colours that are shadowed, that is to say, of those which are made fainter, or more obscure, according as the Object they represent is
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A Treatise of Perspective. 159

more distant, or less exposed to the Light:
My Intention is, to speak of Shadows cast
upon adjacent Bodies, by that which robs
them of the Light, they being placed be-
hind it.

C H A P.

C H A P. IX.

*A General Observation on the
Proportion of Shadows.*

THIS Subject might be enlarged upon, but 'tis sufficient to take notice of what we may remark every day, that when the *Luminous* and *Opaque* Bodies are of an equal bigness, the Shadow made by the *Opaque* Body, ought to be contained between two parallel Lines; that if the *Luminous* Body be the lesser, the Shadow grows and augments infinitely; and on the contrary, if the *Opaque* Body be the lesser, the Shadow diminisheth, and terminates in a Point.

This is the Rule for the Magnitude of Shadows; their Figures are different, according to the difference of the *Opaque* Bodies that occasion them. Experience shews the effect of the Light, when a Body is exposed to it; and what happens to that Body, when it is deprived of it by another. All this is easily comprehended: Yet because I would leave nothing to conjecture, I have made these following Figures; X represents a *Luminous* Body, and Z a *dark Globe* less than

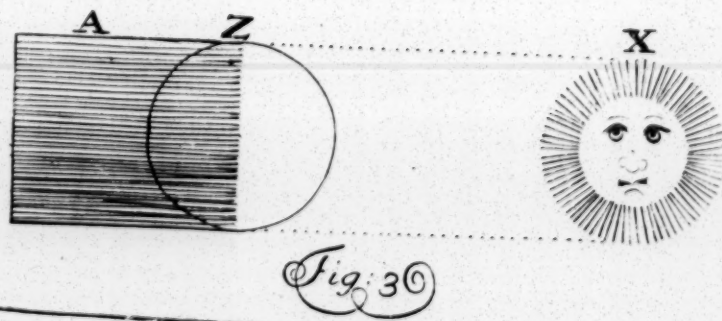
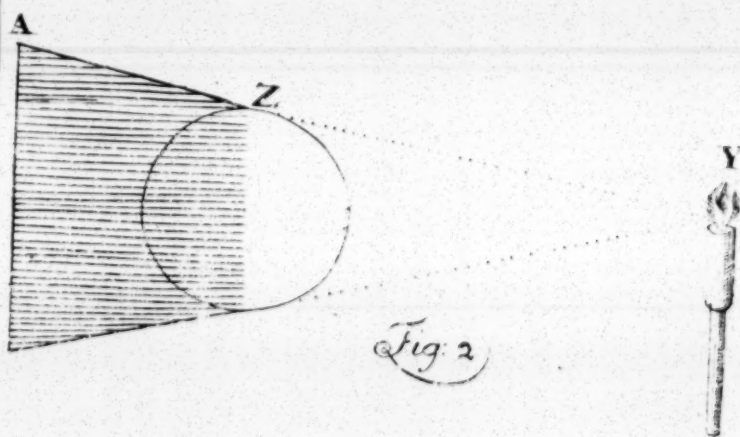
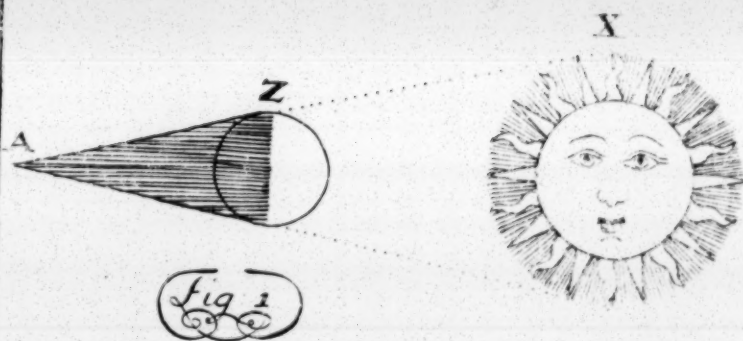
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A Treatise of Perspective. 161

than the *Luminous* Body (see *Plate 29. Fig. 1.*) it is evident that the shadow of X ought to terminate at a Point, and form a *Cone*, whose top or point is A.

If the *Opaque* Globe Z were equal to the *Luminous* Body X, the shadow A of the *Opaque* Body Z, would be contain'd between two parallels, (see *Plate 29. Fig. 3.*)

When the *Luminous* Body Y is less than the *Opaque* Body Z, the contrary ought to happen from what we have observed, when the *Opaque* Body is the smallest; to wit, that its shadow diminishes; for here the shadow A grows larger, (see *Plate 29. Fig. 2.*)

'Tis likewise to be observed, that the shadow is longer or shorter as the *Luminous* Body is more or less elevated. In the Morning when the Sun begins to appear on the *Horizon*; or in the Evening, when he is going down, the Shadows are infinite, as he elevates, they grow shorter: At Noon, when he is above our heads, if he were directly so, we should have no shadows; but this happens only to such as are under the *Torrid Zone*. What shadow he makes in our Climate, is always shortest at that hour. For the clearer Conception of this, see *Plate 30. Fig. 1.* where X represents the Sun, and Y and Z two *Opaque* Bodies of *Cubical* Figures,

162 *A Treatise of Perspective.*

as Gaming Dice: As the Sun is more elevated in regard to Z, so its shadow A is shorter than the shadow B of the body Y, in regard to which, the Sun hath a less Elevation.

Shadow is a privation of Light; so that when an *Opaque* body hinders the Communication, there must be a shadow. All Windows may be considered as *Luminous* bodies; so Objects which cannot be enlightned because of the Interposition of some *Opaque* body, appear obscurest. There are different degrees in shadows, they may be stronger or fainter; for as the light may come from several places, the same Object may have the benefit of one light, and be deprived of another. If it receives no light at all, then it must be covered with a thicker shadow.

The light is sometimes reflected; and there are bodies which do not receive it directly, and consequently ought not to appear in a lively Brightness; but at the same time they are not quite obscure, because in the situation in which they are, the Light is reflected upon them from the neighbouring bodies. *Painters* make a distinction betwixt a *Principal* Light, and what is called a *Reflected* Light. They chuse their Light as they please: They ought to be careful in the observance of their System;

Plate 30

Fig. 1.

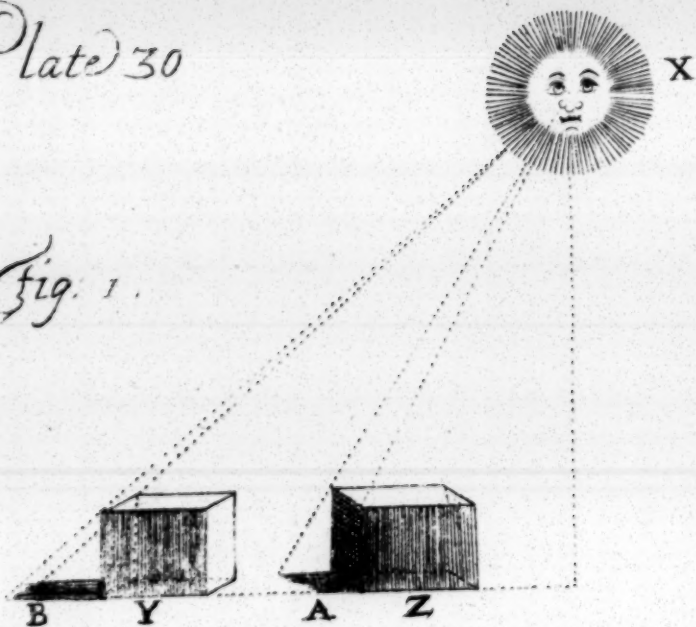


Fig. 2.



A Treatise of Perspective. 163

System; that is to say, that having once chose the place from whence they suppose the Light to come, every thing ought to agree to their Hypothesis. For in fine, every thing ought to be likely in a *Picture*; and Contradiction destroys Likelyhood. 'Tis not likely that a body covered with Shadows, should be exposed to a Light, which is not kept from it by the Interposition of some other body.

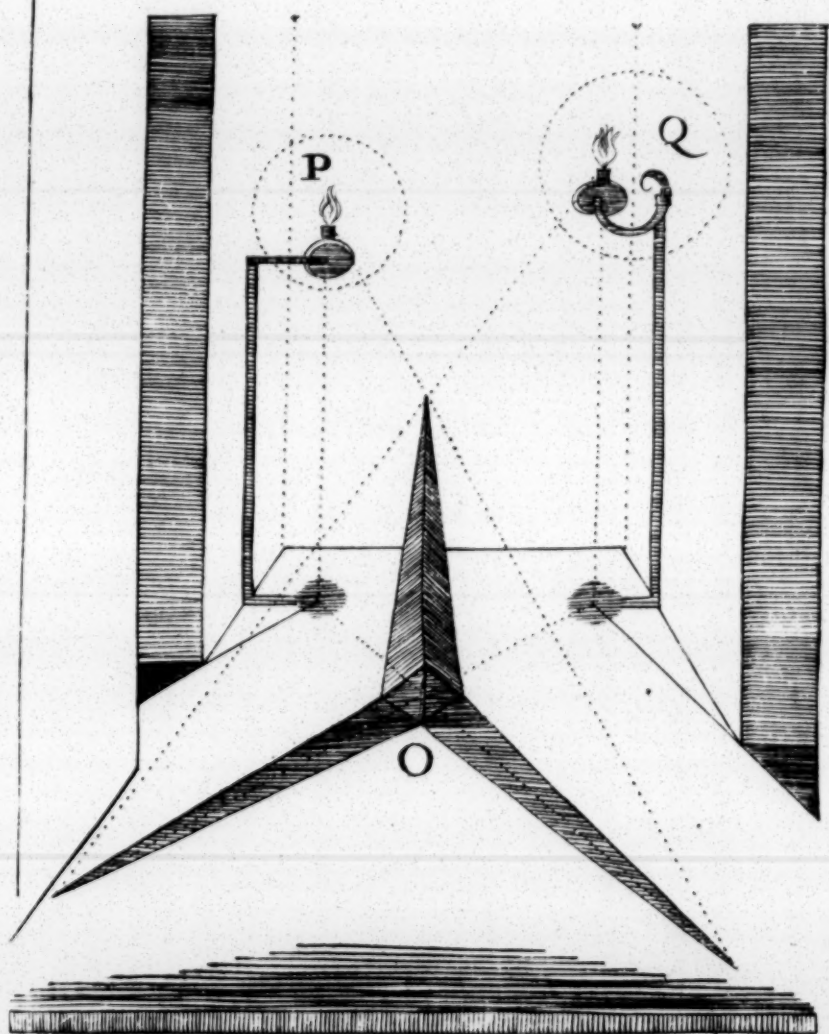
That we may not be deceived in Shadows, let us consider the Works of Nature; that is to say, that having once conceived, and fully concluded upon the design of the Work we project, to the end we may succeed in it, we may make a Model of it on a Table, representing the Geometrical Plan, and observe nicely the Shadow of each body which we are to represent. We must likewise consider the Figure of this shadow. It would be an infinite labour to be obliged to determine what may be the Projection of the Shadow of each body, according to its different Figures or Postures. We might make intire Volumes upon that Head, and there set forth all the Science of *Geometry*. A small attention to what we see, or to easy Experiments, will soon instruct a *Painter* in what

164 *A Treatise of Perspective.*

is necessary to be known. The Sun X lights the reversed Pyramid Z, its shadow is A; and both Reason and Experience shew, that it must have that shape.

There are some *Painters*, who, to be assured of the Effects of a Shadow, place a Lamp in the place from whence they suppose the Light to come. This without question is sufficient to shew the shapes of the Shadows; and the Experiment is very good, to mark all the Effects of the Shadows that are most sensible; for with a full day-light there are so many lights which reflect over all the Air, that there is no perfect shadow; I mean, that is very black. It is not so in the night-time, when there is no light but what comes from one or more Lamps. Consider then the Pyramid O, that it is lighted by two Lamps P and Q; and that it hides the light from the parts behind it. We have endeavoured to describe all the Effects of these two Lamps, to the end that upon occasion, nothing may escape the Diligence of a *Painter*, and that he may observe where the Snadows of *Opaque* bodies should be, (see Plate 31.)

But





A Treatise of Perspective. 165

But after all, there is a great difference between the Effect of a Lamp, and that of the Sun: Colours seen by an *Artificial* Light, appear very different from what they are, when seen in full day-light. The Light which is spread over all the Air when the Sun shines, and surrounds the bodies, lights them on all sides, which a Lamp cannot do: Therefore it is only good for representing the time which we then use; that is to say, a night enlightened by Art, while the Natural Light is absent.

'Tis needless for me to stay longer on this Subject, or to be particular upon all the different shapes of Shadows, with respect to the bodies that occasion them, and to the *Luminous* bodies of which they hinder the Effects. That is easy; therefore I shall only say, that after having well observed the Figure, and the Measure of the Shadows of Objects on the Geometrical Plan; we must find the *Perspective* of this Figure, and the *Perspective* bigness of that measure.

This is the true way of working exactly; but *Painters* are not at so great pains, their work will not allow it; they are forced to make several Pictures in a Year for an honest

166 *A Treatise of Perspective.*

Livelihood. The Illustrious *Painters* in ancient times, imployed whole Years in making one *Picture*: What did I say, in making? They were whole Years in forming the Design; which costs the least trouble to most *Painters* now. The most Laborious and the most Exact, design by the Eye what they would imitate: So that we seldom see Pieces worthy of Admiration.

This Treatise of *Perspective* cannot be acceptable, but to such *Painters* as aim at Perfection: Those of the Indifferent sort, look upon it as useless, because they are sensible of their own Weakness in making use of it: I hope such as are in a Condition to examine it, will judge otherways. Besides, I pretend not that every *Picture* ought to be an exact *Perspective*; or that none can be fine, if the Objects there represented, and which we suppose would be seen, if it were transparent, appear not in their natural bigness, and in their true distance. This is to be wished: Yet I acknowledge there are some very fine *Pictures*, that have not these Advantages: But we cannot from thence conclude, that *Perspective* is only good for painting the Schens of a
Theater,

A Treatise of Perspective. 167

Theater, or some *Architecture* in the farther end of a Gallery.

A *Picture*, I say, may be Excellent, tho' it have not the Effect of an exact *Perspective*; which is impossible, when the Figures are all much smaller than the Natural, and so cannot make the same Impressions as the things themselves which we represent. In fine, *Painting* cannot please if it be not reasonable: And this it cannot be, if the Imitation be not perfect; that is to say, if it do not imitate the truth. We are sensible, that what is acted on a *Theater*, is but a Fiction; the *Theater* is too small; all is there too much contracted, both the time and the place, to conceal its being only a Representation; but tho' the truth be wanting, we find the Likelihood, without which, the piece would appear ridiculous. Every thing must likewise, in a *Picture*, have the resemblance of truth. Having therefore supposed the Action which is to be represented, to be seen from a certain Point, 'tis to that Point that all ought to be directed. A *Picture* may be great or small. We may suppose Objects such as we would have them; but there must be a point of sight, to which all tends;

168 *A Treatise of Perspective.*

and we cannot draw one stroke of a Pencil,
without having a regard to this Point; which
is impossible to be done without *Perspective*;
and this proves *Perspective* to be the Foun-
dation of *Painting*.

CHAP.



CHAP. X.

*A Conference of Socrates with
Parrhasus the famous Pain-
ter, and with Cliton the inge-
nious Carver.*

*Taken out of the third Book of Xenophon, con-
cerning memorable things relating to him.*

I Have often in this Treatise, foreseen that I may be blam'd, for daring to speak of *Painting*, which I am ignorant of. It is not fit to meddle with what we do not know. I own I can neither Design nor Paint; How shall I then justify my Conduct? I have said, I speak only of the means of finding the *Perspective* of the Points and Lines which terminate and measure the Dimensions of a Body proposed to be put in *Perspective*, which belongs to *Geometry*. But, say they, you go beyond the extent of *Perspective*, in meddling to give your Sentiment of *Painting* in general. I must give a reason for this, and to that end shall relate a Conference between *Socrates* and two famous

170 *A Treatise of Perspective.*

famous Workmen, one of which was a *Painter*, and the other a *Carver*; which will be sufficient to demonstrate, that we may contribute to the Perfection of Arts, without being *Mechanicks*.

Zenophon, in his third Book of the memorable things of *Socrates*, relates a Conference that *Socrates* had with *Parrhasius* the excellent *Painter*, and with *Cliton* the ingenious *Carver*. The Philosopher instructs them in what might render their Works more perfect: This he does after his ordinary manner, interrogating them in such order, that in their answers they speak as if they knew before-hand what he asked them, and what they wanted to be instructed in. They easily acknowledge the truths he discovers. This was his method in all the Instructions he gave, it being admirably well calculated for Instruction. This Conference was long ago translated into *French* from the *Greek*, by an eminent Collegiate. And it is thus: *Zenophon* speaking of *Socrates*.

“ He was admirable in all Conversation,
 “ and if he met even with a *Mechanick*,
 “ he spoke always something that might be
 “ serviceable to him.

“ Being once in the Work-house of *Parrhasius* the *Painter*, he convers’d with him
 “ after

A Treatise of Perspective. 171

“ after this manner. Is not *Painting* a Representation of all that we see? For with a little Colour, you represent on Cloath, Mountains and Caves, Light and Obscurity: You make a difference between what is hard, and what is soft; between what is smooth, and what is rugged: You give to Bodies Youth and Old Age; and when you would represent a perfect Beauty, such as is impossible to be found, without some fault or other; you use to consider a great many; and taking from each what pleases you, you make one every way accomplish'd.

“ You are in the right, answered *Parrhasius*.

“ Can you represent, said *Socrates*, what is yet more Charming, and more amiable in a Person, I mean the Inclination?

“ How would you, answered *Parrhasius*, that I should paint what cannot be express'd by any Proportion, nor with any Colour, and what hath nothing common with all those things you have named, which are imitable by the Pencil; in a word, what cannot be seen?

“ Do not Men, replied *Socrates*, make Hatred and Friendship appear in their Countenances?

“ Yes,

172 *A Treatise of Perspective.*

“ Yes, I think so, said *Parrhasius*.

“ Then it is possible to observe Hatred or
“ Friendship in the Eyes?

“ I acknowledge?

“ Do you likewise believe, pursued *Socrates*, that in the Adversity and Prosperity of Friends, those who are interested
“ keep the same Countenance as those who
“ are not concern'd?

“ No ways, said he, for in the time
“ of our Friends Prosperity, our Visage is
“ Gay, and full of Joy; whereas in their
“ Adversity, we are Dull and Melancholly.

“ This then can be likewise painted.

“ 'Tis certain.

“ Farther, said *Socrates*, Magnificence,
“ Generosity, Baseness, Cowardice, Modesty, Prudence, Insolence, and Rusticity; all these appear in the Visage or
“ in the Posture of a Man, whither sitting or
“ standing.

“ You say right.

“ Then this can be imitated by the Pencil?

“ It may.

“ And whither find you greater Pleasure,
“ said *Socrates*, in seeing the Portrait of a
“ Man, who by his Looks displays a good
“ Temper, and good Manners, or of one
“ who carries the marks of a Vicious Inclination in his Visage?

“ There

A Treatise of Perspective. 173

“ There is no Comparison there, said
“ *Parrhasius*.

“ Another time discoursing with *Cliton*
“ the *Carver*, I am no ways astonished, said
“ he, at your putting so great a difference
“ betwixt the Statue of a Champion that
“ runs away, and that of one who stands
“ his ground and faces his Enemy, in order
“ either to Wrestle, to fight with the Dag-
“ ger, or to exercise at all sorts of Fencing.
“ But what Surprises the beholders, is, that
“ your Statues seem to have Life: I would
“ fain know by what Art you inspire them
“ with this admirable Vivacity? *Cliton* being
“ surpris'd at this Question, and not answer-
“ ing quickly, *Socrates* went on as follows;
“ Perhaps you take great care to make them
“ like Persons that are living; and this is the
“ reason that they seem to be likewise alive.

“ 'Tis so, said *Cliton*.

“ Certainly then, replied *Socrates*, you
“ must observe very exactly amongst the dif-
“ ferent Postures of Bodies, which are the
“ most natural Dispositions of all the parts;
“ for when some bow down, others are lifted
“ up; when some are pressed, others are ex-
“ tended; when some are strongly bound,
“ others are relaxed; and in imitating all this,
“ you make your Statues approach very near
“ to Nature.

“ 'Tis

174 *A Treatise of Perspective.*

“ 'Tis true, said *Cliton*.

“ Is it not likewise true, continues *Socrates*, that 'tis a great Satisfaction to the Spectators, when all the Passions of a Man in Action, are well expressed? So in the Statue of a Champion fighting, that furious look with which he threatens his Enemy, must be imitated; and on the contrary, to a Victorious Champion must be given a gay and contented Countenance.

“ 'Tis not to be doubted.

“ Then, said *Socrates*, an excellent Statuary must represent the Actions of the Soul, by the Motions of the Body.

Such like Conferences, might, without doubt, be very useful to *Mechanicks*. *Socrates* was neither *Painter* nor *Carver*; yet we may say, he contributed by such Instructions, to carry both *Painting* and *Carving* to that distinguishing degree of Perfection, that these two Arts were arriv'd at in his time.



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